USAAEFA PROJECT NO. 83-05

AIRWORTHINESS AND FLIGHT CHARACTERISTICS TEST OF THE JOH - 6A LIGHT COMBAT HELICOPTER CONFIGURED WITH A WIRE STRIKE PROTECTION SYSTEM

USAAEFA

AD-A144 880

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NOVEMBER 1983

FINAL REPORT

SINCE THE CONDUCT OF THIS TEST THE AIRCRAFT HAS BEEN REDESIGNATED THE AH - 6C.

UNITED STATES ARMY AVIATION ENGINEERING FLIGHT ACTIVITY
EDWARDS AIR FORCE BASE, CALIFORNIA 93523

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1. REPORT NUMBER: USAAEFA PROJECT NO. 83-05	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): AIRWORTHINESS AND FLIGHT CHARACTERISTICS OF THE JOH-6A LIGHT COMBAT HELICOPTER CONFIGURED WITH A WIRE STRIKE PROTECTION SYSTEM	5. TYPE OF REPORT & PERIOD COVERED: FINAL 30 AUG-2 SEP 1983
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): JAMES L. WEBRE, ERIC MITCHELL, RALPH WORATSCHEK, RICHARD ADLER	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: US ARMY AVN ENGINEERING FLIGHT ACTIVITY, EDWARDS AIR FORCE BASE, CA 93523	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: EN-3-Z0101-01-EN-EC
11. CONTROLLING OFFICE NAME AND ADDRESS: US ARMY AVIATION SYSTEMS COMMAND, 4300 GOODFELLOW BOULEVARD, ST. LOUIS, MO 63120	12. REPORT DATE: NOVEMBER 1983
	13. NUMBER OF PAGES: 54
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Airworthiness and Flight Characteristics
Handling Qualities
Wire Strike Protection System
Light Combat Helicopter

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A limited airworthiness and flight characteristics test on the JOH-6A Light Combat Helicopter (LCH) configured with a wire strike protection system (WSPS) was conducted to substantiate the airworthiness. Tests were conducted at Edwards Air Force Base, California in four flights totaling 4.1 productive flight hours. The insufficient ground clearance of the lower cutter allows contact with the ground and is a deficiency. The handling qualities of the

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JOH-6A LCH with WSPS installed are essentially unchanged from the JOH-6A LCH without WSPS.

A-1

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY AVIATION SYSTEMS COMMAND
4300 GOODFELLOW BOULEVARD, ST. LOUIS, MO 63120

REPLY TO
ATTENTION OF

DRSAV-E

SUBJECT: Directorate for Engineering Position of the Final Report of USAAEFA Project No. 83-05, Airworthiness and Flight Characteristics Test of the JOH-6A Flight Combat Helicopter Configured with a Wire Strike Protection System

SEE DISTRIBUTION

1. The purpose of this letter is to establish the Directorate for Engineering position on the subject report. The report documents the handling qualities of the JOH-6A Light Combat Helicopter (LCH) with a wire strike protection system (WSPS) installed.

2. This Directorate agrees with the Conclusions and Recommendations stated in the report except as indicated below. Also, additional comments are provided and are applicable to the paragrapns as indicated.

a. Paragraphs 13 and 15. Disagree that the insufficient ground clearance of the lower cutter assembly is a deficiency during a normal run on landing at the high gross weight of 2700 lb. This should be a shortcoming. The caution recommended adequately advises the pilot to take care and provides instructions to prevent ground contact of the lower cutter assembly. Additionally, inadvertent ground contact will result in shearing the cutter extension shear rivets and reducing the probability of structural damage. The OH-58 A/C helicopters also have the same type design with a frangible cutter extension for precluding structural damage.

b. Paragraph 1c. The effect of the IR landing light on the operation of the WSPS is unknown. It is expected at worst to slightly increase the frontal vulnerable area as compared to the IR light being removed. It is not considered practical at this time to conduct actual wire strike tests to determine, if any, reduction in WSPS effectiveness. Consideration will be given to conducting an analysis to determine any reduction in effectiveness.

FOR THE COMMANDER:

Ronald E. Gormont

RONALD E. GORMONT
Acting Director of Engineering

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INTRODUCTION

BACKGROUND

1. The US Army has identified a need for a special mission helicopter that is air-transportable by C-130 aircraft. The OH-6A helicopter was selected and after modifications was designated the JOH-6A light combat helicopter (LCH). Since the conduct of this test the aircraft has been redesignated the AH-6C. The US Army Aviation Research and Development Command (AVRADCOM) requested that the US Army Aviation Engineering Flight Activity (USAAEFA) conduct a limited Airworthiness and Flight Characteristics (A&FC) test on a JOH-6A LCH configured with a wire strike protection system (WSPS) (ref 1, app A). The WSPS was developed by Bristol Aerospace Ltd., Winnipeg, Canada, and was certified for use on the Hughes 500 Helicopter. The WSPS was subjected to structural analysis, handling qualities testing, and simulated wire strike tests by the Canadians. Additionally, the Applied Technology Laboratory, Research Technology Laboratory, and AVRADCOM conducted dynamic tests of the WSPS installed on the OH-58A at the Impact Dynamics facility, NASA Langley Research Center.

TEST OBJECTIVES

2. The objectives of this test were to obtain handling qualities data necessary to substantiate the airworthiness of the JOH-6A LCH with WSPS installed.

DESCRIPTION

3. The test helicopter (USA S/N 69-16054) was manufactured by Hughes Helicopters, Incorporated. A major LCH modification replaced the standard engine (T63-A-5A) with a T63-A-720 having an uninstalled sea level rating of 420 shaft horsepower (SHP). Transmission limits restrict power to 272 SHP for takeoff. Other modifications included: installation of military avionics with secure voice capability, LTN-211 Omega/VLF navigation system, one M158A1 7 tube, 2.75 inch folding fin aerial rocket (FFAR) pod mounted on the right side and one M27E1 7.62mm minigun armament subsystem mounted on the left side of the aircraft. The WSPS was mounted on the cabin roof and lower forward canopy. Photographs of the test aircraft are presented in appendix B. A detailed description of the OH-6A is contained in the operator's manual (ref 2) and a description of modifications incorporated to configure the aircraft to the JOH-6A LCH configuration are contained in the airworthiness release (ref 3). A description of the WSPS is contained in appendix B. A description of test instrumentation is contained in appendix C.

TEST SCOPE

4. The A&FC of the JOH-6A LCH with WSPS was conducted at Edwards Air Force Base, California from 30 August to 2 September 1983. Four flights were conducted for a total of 4.1 productive flight hours. Tests were conducted at the test conditions shown in table 1. The limitations shown in the operator's manual and the airworthiness release were observed. Center of gravity (cg) and airspeed limitations from the airworthiness release are presented in figures 1 and 2, appendix B.

TEST METHODOLOGY

5. Flight test techniques used are described in reference 4, appendix A. Test methods and data analysis methods are briefly described in appendix D. Ball-centered (coordinated) flight was used for test trim conditions. Data were recorded utilizing an onboard magnetic tape recording system. Control system rigging check and aircraft weight and balance were performed by USAAEFA personnel.

Table 1. Handling Qualities Test Conditions[1]

Test	Average Gross Weight (lb)	Longitudinal Center of Gravity (FS)	Density Altitude (ft)	Calibrated Airspeed (KCAS)	Remarks
Static Lateral-Directional Stability	2600	99.0(FWD)	7000	59-79	Level flight, climb and autorotation
Dynamic Stability	2630	99.0(FWD)	7340	55-75	Climb and level flight
Low Speed Flight	2660	99.1-99.2(FWD)	3510	Sideward: 0-38 KTAS[2] Rearward: 0-31 KTAS Forward: 0-31 KTAS	Skid height 5 ft

NOTES:

[1]Tests were conducted with doors off in trimmed ball-centered flight and mid-lateral center of gravity
[2]Knots true airspeed

RESULTS AND DISCUSSION

GENERAL

6. A limited A&FC test of the JOH-6A LCH helicopter with WSPS installed was conducted at Edwards AFB, California at the general test conditions listed in table 1. The handling qualities of the JOH-6A LCH with WSPS installed were essentially unchanged from the basic JOH-6A LCH. One deficiency, attributable to the WSPS installation, was identified: the insufficient ground clearance of the lower cutter allows contact with the ground during run-on landings at high gross weights. One shortcoming was identified which was previously reported for the JOH-6A LCH.

HANDLING QUALITIES

Static Lateral-Directional Stability

7. Static lateral-directional control characteristics of the JOH-6A LCH were evaluated in climbs, autorotational descents, and level flight at the conditions shown in table 1. Data are presented in figures 1 through 4, appendix E. At all conditions tested, the JOH-6A LCH with the WSPS installed exhibited positive directional stability (increased left directional control for increased right sideslip), and positive dihedral effect (increased right lateral control with increased right sideslip). The gradient of directional control position with change in sideslip angle in level flight was approximately 12 degrees of sideslip angle per inch of pedal displacement at 60 knots calibrated airspeed (KCAS) while the gradient at 79 KCAS was slightly steeper (7 degrees of sideslip angle per inch of pedal displacement). Sideforce cues were weak about trim at these airspeeds as evidenced by the small change in roll attitude with sideslip. The static lateral-directional stability characteristics of the JOH-6A with WSPS installed are essentially unchanged from those of the standard JOH-6A LCH (ref 5, app A).

Dynamic Stability

8. Lateral-directional dynamic stability was evaluated in level flight at 55 and 75 KCAS at the conditions presented in table 1. The aircraft response to pedal doublets is presented in figures 5 and 6, appendix E. An easily excited but damped lateral-directional oscillation (2.0 to 2.5 second period) developed during all flight conditions. This response was more pronounced during maximum power climbs at 60 KCAS (fig. 7, app E). The oscillation was more damped at the higher airspeed (75 KCAS) tested. The lateral-directional dynamic stability characteristics of the JOH-6A LCH with WSPS installed are essentially unchanged from those of the standard JOH-6A LCH (ref 5, app A).

Low Speed Flight Characteristics

9. The low speed flight characteristics of the JOH-6A LCH with WSPS were evaluated at the conditions presented in table 1 using a calibrated ground pace vehicle as a speed reference. Surface wind conditions were less than 5 knots and skid height was approximately 5 feet. Control positions during low speed flight are presented in figures 8 through 11, appendix E. Less than 10% aft longitudinal control margin existed for left sideward flight at speeds in excess of 20 knots true airspeed (KTAS) and for rearward and 225 degree (critical) relative azimuth flight at speeds in excess of 15 KTAS. The limited aft longitudinal control margin, however, was not evident to the pilot. Random pitch, roll and yaw excursions during left and right sideward flight between 10 and 20 KTAS are a shortcoming previously reported (ref 5, app A). The low speed flight characteristics of the JOH-6A LCH with WSPS installed are essentially unchanged from the basic JOH-6A LCH.

Lower Wire Cutter Ground Clearance

10. Lower wire cutter ground clearance was evaluated at 2700 lb gross weight by conducting run-on landings. A Fome-Cor® lower cutter extension was installed to prevent damage to the airframe. Ground clearance prior to takeoff was 1.9 inches (photo 6, app B). During landing, the landing gear oleo-struts compressed sufficiently to allow the lower cutter to contact the ground which resulted in damage to the cutter extension (photo 7, app B). The insufficient ground clearance of the lower cutter assembly allows contact with the ground when making a normal run-on landing at 2700 lb gross weight and is a deficiency. Until the deficiency is corrected, the following caution should be placed in the operator's manual of the LCH configuration with WSPS installed.

CAUTION

> Ground clearance of the lower WSPS cutter is minimal at high gross weights. Care should be exercised when operating from unimproved areas or when run-on landings are anticipated to prevent ground contact of the lower cutter assembly.

Infrared (IR) Landing Light with WSPS Installed

11. The IR landing light as installed in the test aircraft extends forward of the WSPS midsection deflector. The protrusion of the IR landing light (photo 8, app B) could interfere with

the proper functioning of the wire strike protection system. An evaluation of the WSPS as installed on the JOH-6A LCH should be conducted to determine what effect the IR landing light has on WSPS operation.

CONCLUSIONS

GENERAL

12. The handling qualities of the JOH-6A LCH with WSPS installed are essentially unchanged from the JOH-6A LCH as reported in reference 5, appendix A.

DEFICIENCY

13. The insufficient ground clearance of the lower cutter assembly allows contact with the ground when making a normal run-on landing at 2700 lb gross weight (para 10).

RECOMMENDATIONS

14. Correct the deficiency listed in paragraph 13.

15. The following caution should be placed in the operator's manual of the JOH-6A LCH with WSPS installed (para 10).

CAUTION

> Ground clearance of the lower WSPS cutter is minimal at high gross weights. Care should be exercised when operating from unimproved areas or when run-on landings are anticipated to prevent ground contact of the lower cutter assembly.

16. An evaluation of the WSPS as installed on the JOH-6A LCH should be conducted to determine what effect the IR landing light has on WSPS operation (para 11).

APPENDIX A. REFERENCES

1. Letter, AVRADCOM, DRDAV-DI, 12 April 1981, subject: Airworthiness and Flight Characteristics Test of OH-6A Configured with a Wire Strike Protection System. (Test Request)

2. Operator's Manual, TM 55-1520-214-10, *Helicopter Observation OH-6A*, 17 December 1976, through change 11, 11 January 1982.

3. Letter, AVRADCOM, DRDAV-D, 31 August 1983, subject: Airworthiness Release for Flight Operation of the JOH-6A Aircraft (69-16054), USAAEFA Project No. 83-05.

4. Flight Test Manual, Naval Air Test Center, FTM No. 101, *Stability and Control*, 10 June 1968.

5. Final Report, USAAEFA, Project No. 81-04, *Airworthiness and Flight Characteristics Test of the OH-6A Configured to a Light Combat Helicopter (JOH-6A LCH)*, November 1983.

APPENDIX B. DESCRIPTION

GENERAL

1. The test aircraft, a JOH-6A (S/N 69-16054) light combat helicopter (LCH) with the wire strike protection system (WSPS), was a standard OH-6A aircraft in accordance with Hughes Helicopter detail specification HTC-A369-V-8003A and the operator's manual except for LCH modifications and instrumentation installation (photos 1 and 2). A detailed description of the standard OH-6A is presented in reference 2, appendix A. The LCH modifications and a detailed description of the WSPS are presented in reference 3, appendix A. The longitudinal center of gravity and airspeed envelopes as modified by reference 3 are shown in figures 1 and 2.

HELICOPTER OBSERVATION OH-6A

2. The OH-6A aircraft is a four place, dual control, single engine observation helicopter. It incorporates a single 4-bladed main rotor, a 2-bladed tail rotor and an oleo-damped skid-type landing gear. The main rotor is fully articulated while the tail rotor is semi-rigid. The aircraft is powered by a single free turbine, turboshaft engine mounted in the aft fuselage section directly behind the cargo compartment.

3. The JOH-6A LCH is equipped with a T63-A-720 turbine engine having an uninstalled sea level rating of 420 shaft horsepower (SHP).

DIMENSIONAL DATA

4. Primary dimensional data is presented in figures 3 and 4.

WIRE STRIKE PROTECTION SYSTEM

5. The WSPS was installed in accordance with reference 3, appendix A. Major components are as follows:

a. An upper cutter assembly (photo 3) was installed on the cockpit roof and extended forward at a height of 9.2 inches above the roof. Supports were mounted on the upper cutter, 4 inches above the roof, and attached to the airframe at fuselage station (FS) 89.39 and on either side at buttline (BL) 9.8 left and right.

b. The lower cutter (photo 4) assembly was installed on the forward aircraft belly centerline. The assembly consists of the main cutter, the cutter extension and the support struts. The main cutter extended 10 inches below the aircraft fuselage. The cutter extension mounted to the main cutter via two shear rivets and extended an additional 3.5 inches below the main cutter. Support struts were mounted to the main cutter and to the airframe at FS 62.4 and BL 12.0 left and right.

c. The midsection deflector (photo 5) consists of 3 channels with inserts and two "U" shaped yokes. Channels with inserts and yokes provide a non-interrupted surface for cable deflection to either the upper or lower cutter assembly.

6. Detailed drawings of WSPS installation are presented in Bristol Aerospace, Limited, Drawing Nos. 441-83041 through 441-83045.

FIGURE 1
AIRWORTHINESS RELEASE GROSS WEIGHT - - LONGITUDINAL
CENTER-OF-GRAVITY ENVELOPE
JOH-6A LCH (AH-6C)

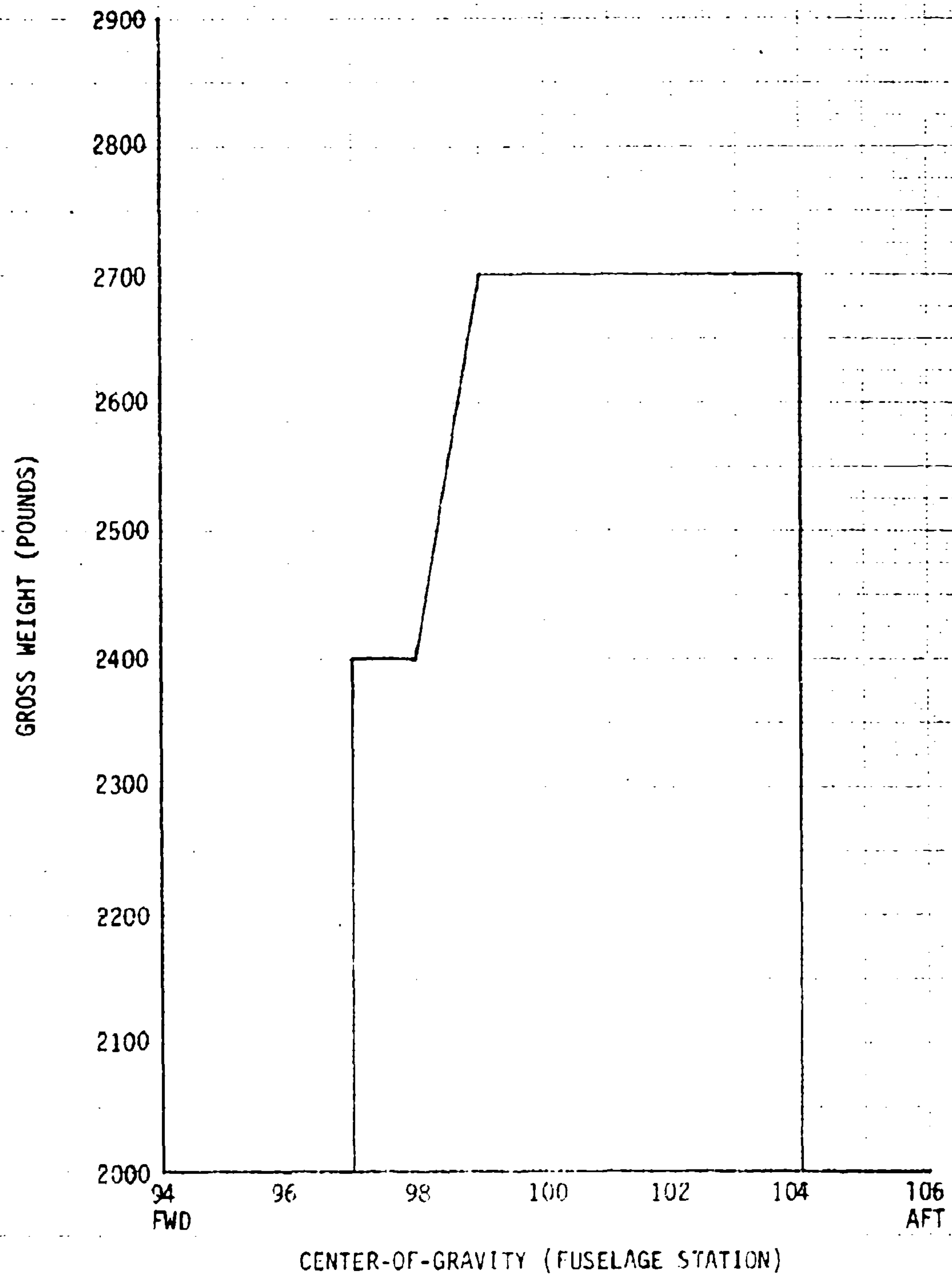
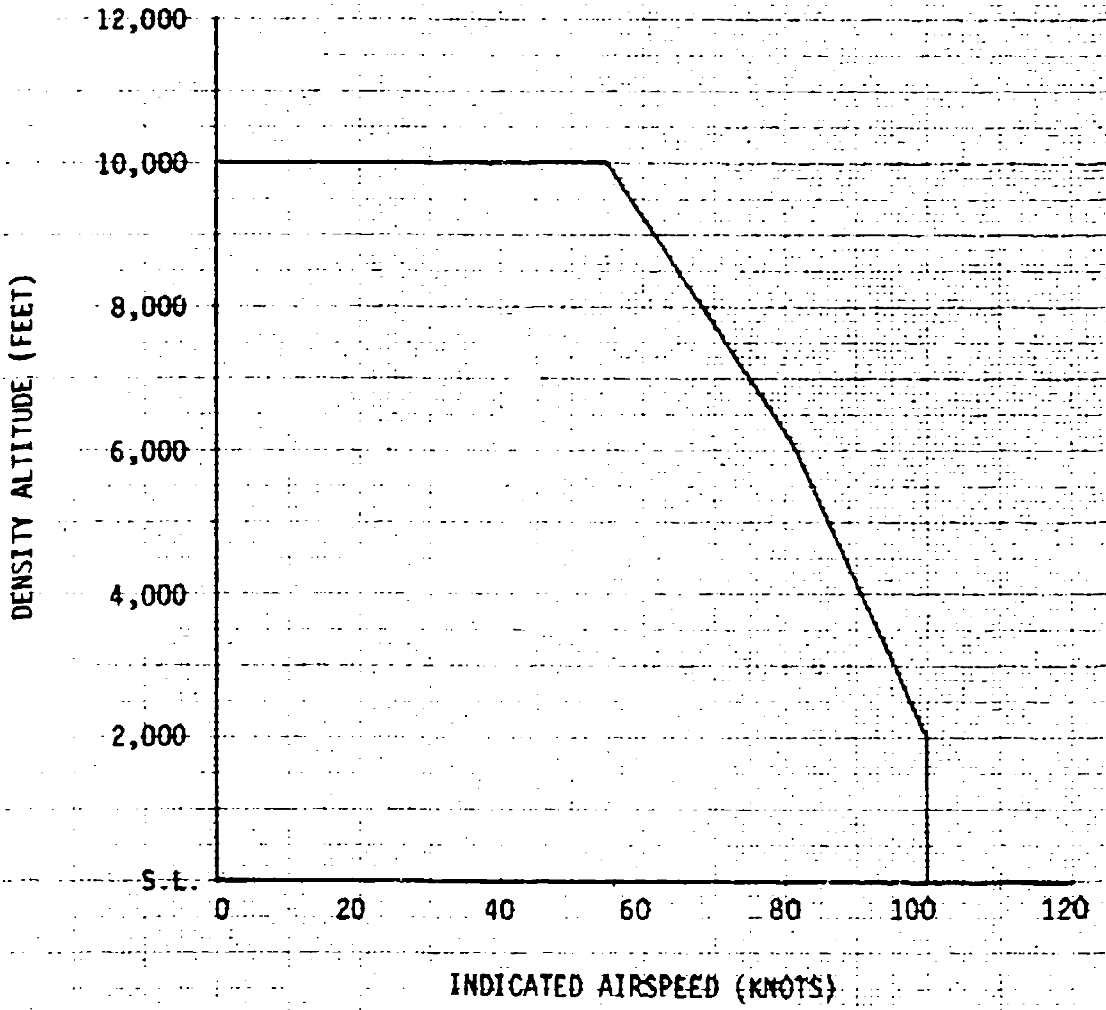


FIGURE 2
AIRWORTHINESS RELEASE AIRSPEED LIMITS
JOH-6A LCH (AH-6C)



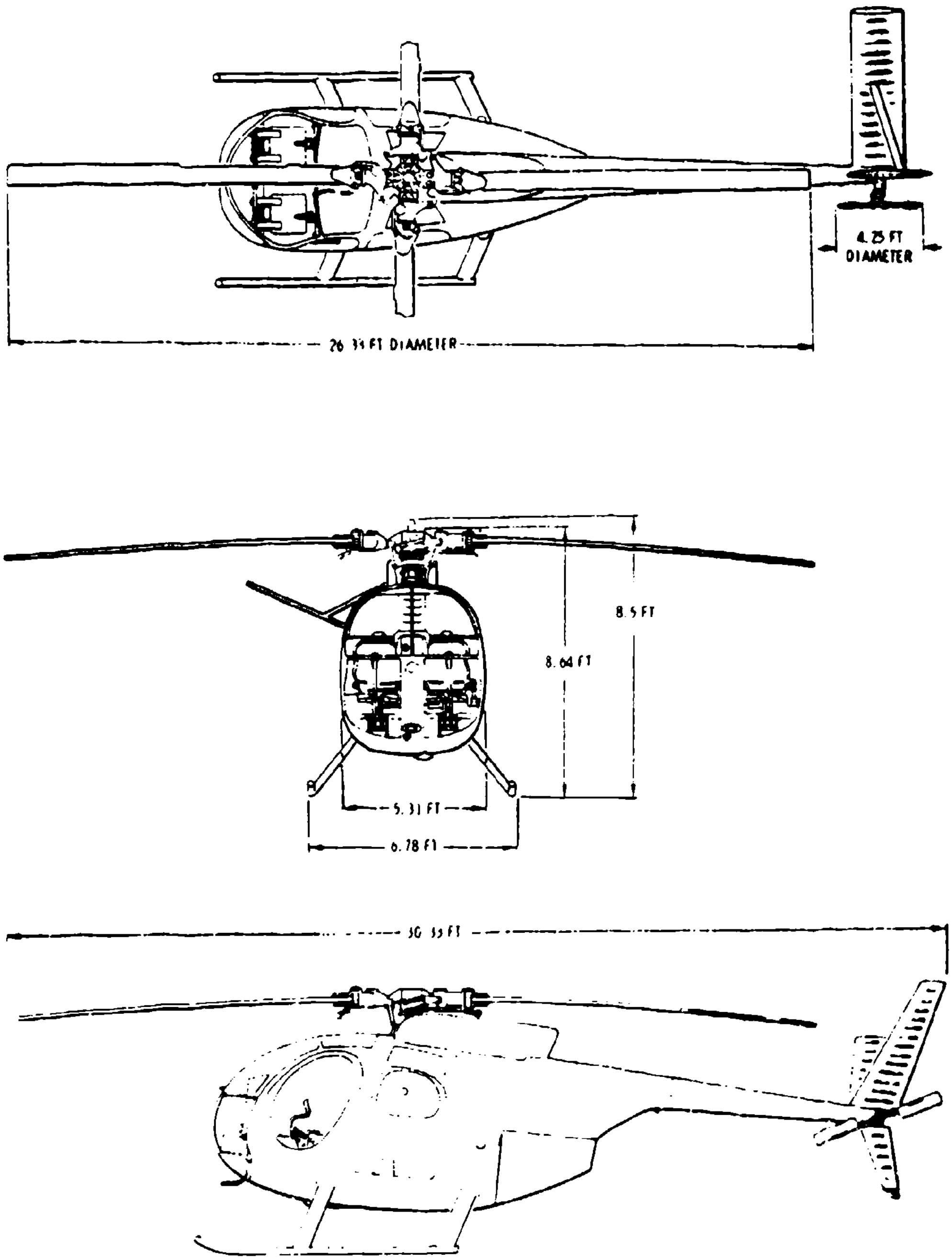


Figure 3. OH-6A Principal Dimensions

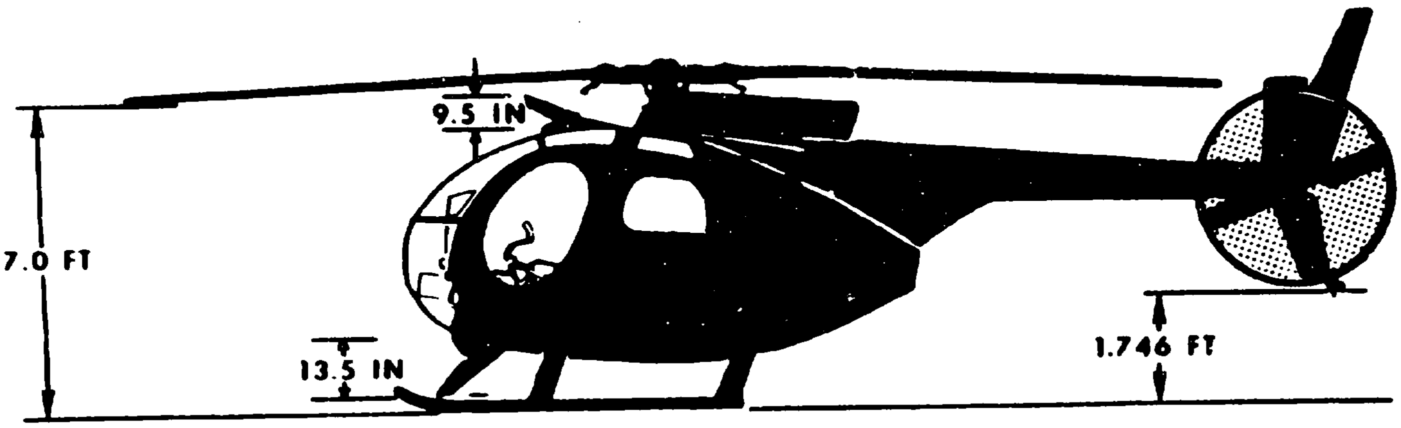


Figure 4. Ground and Rotor Clearances

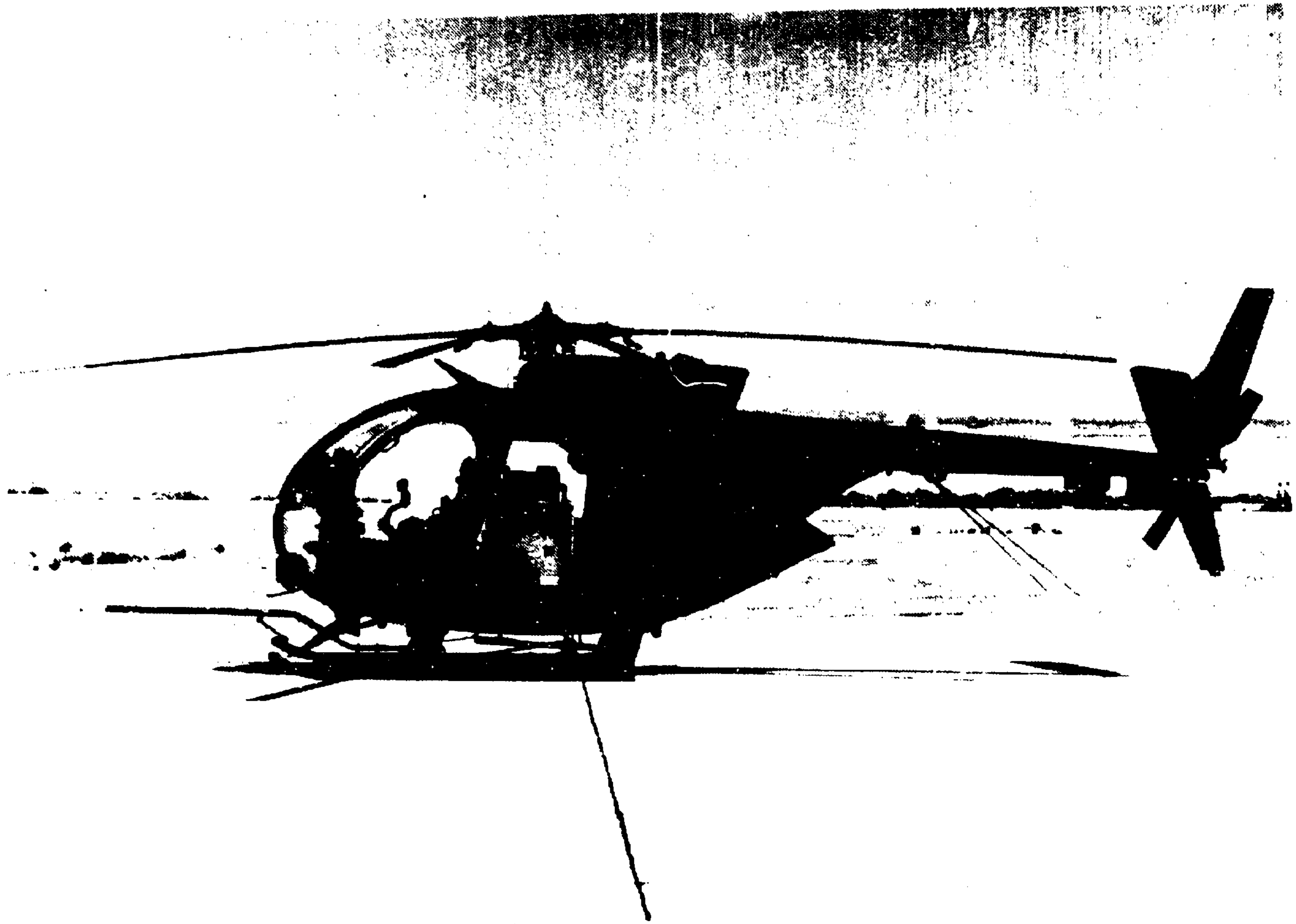


Photo 1. JOH-6A (LCH) with WSPS   Left Side View

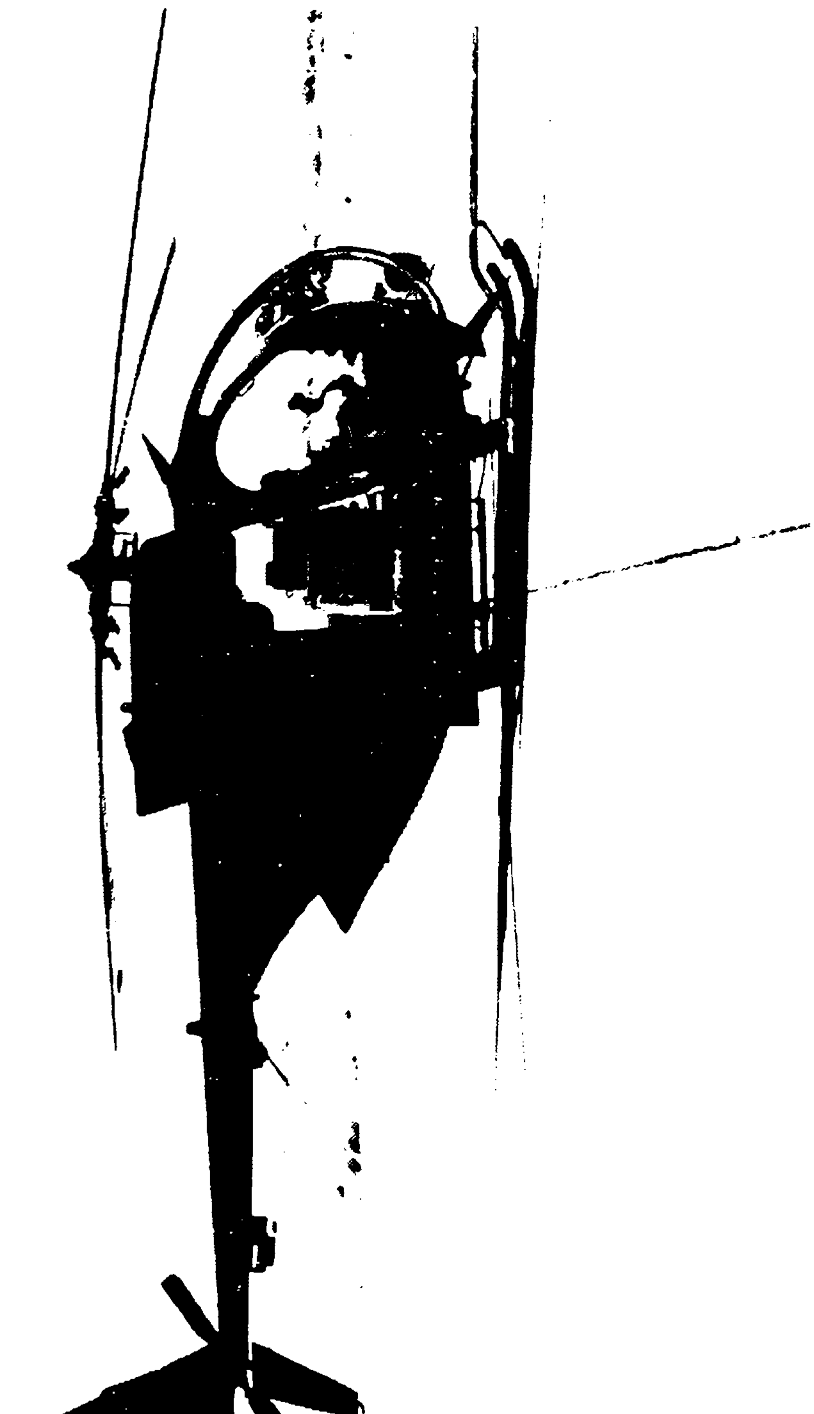


Photo 2. JOH-6A (LCH) with WSPS Right Side View

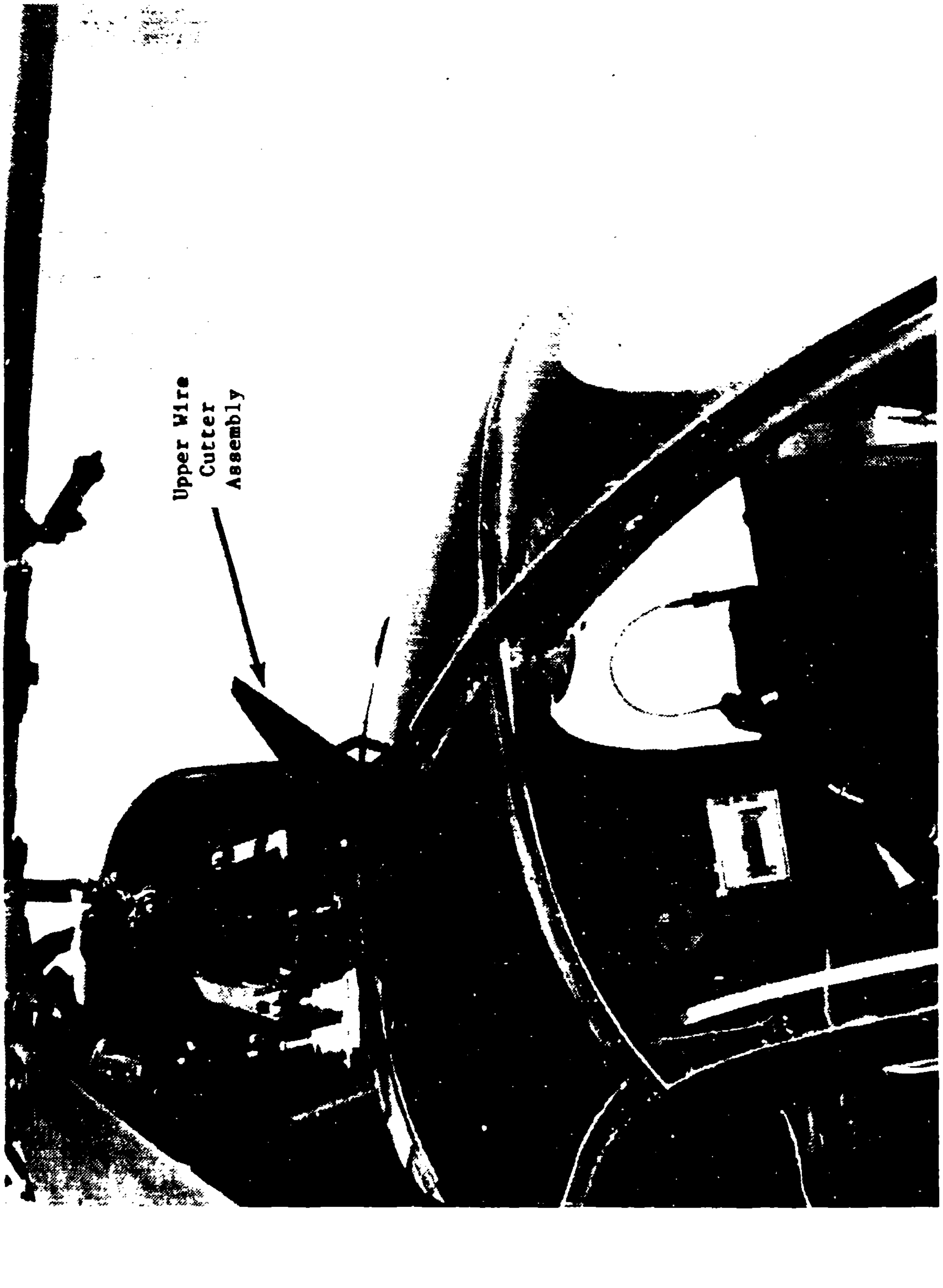


Photo 3. Upper Wire Cutter

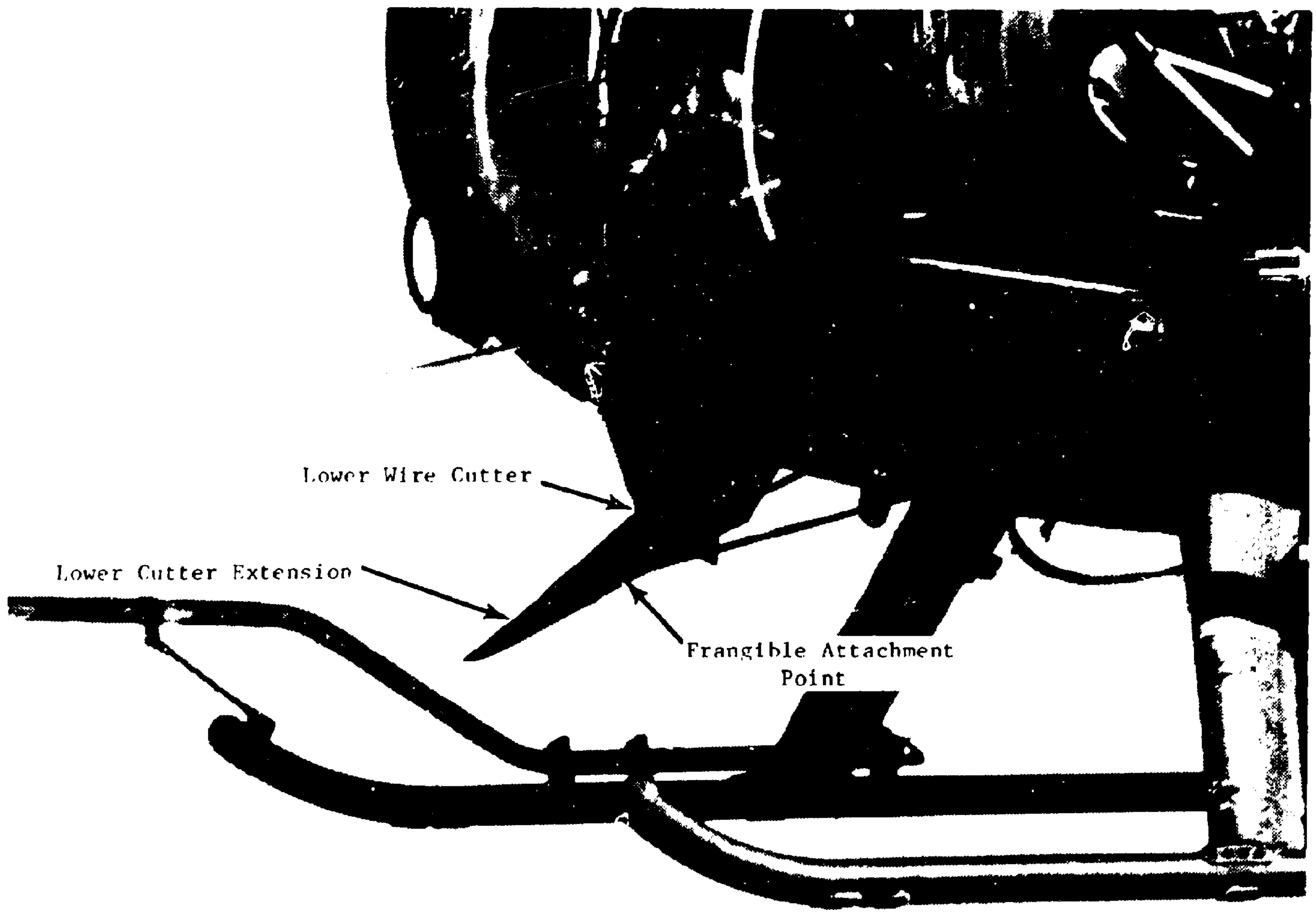


Photo 4. Lower Wire Cutter Assembly

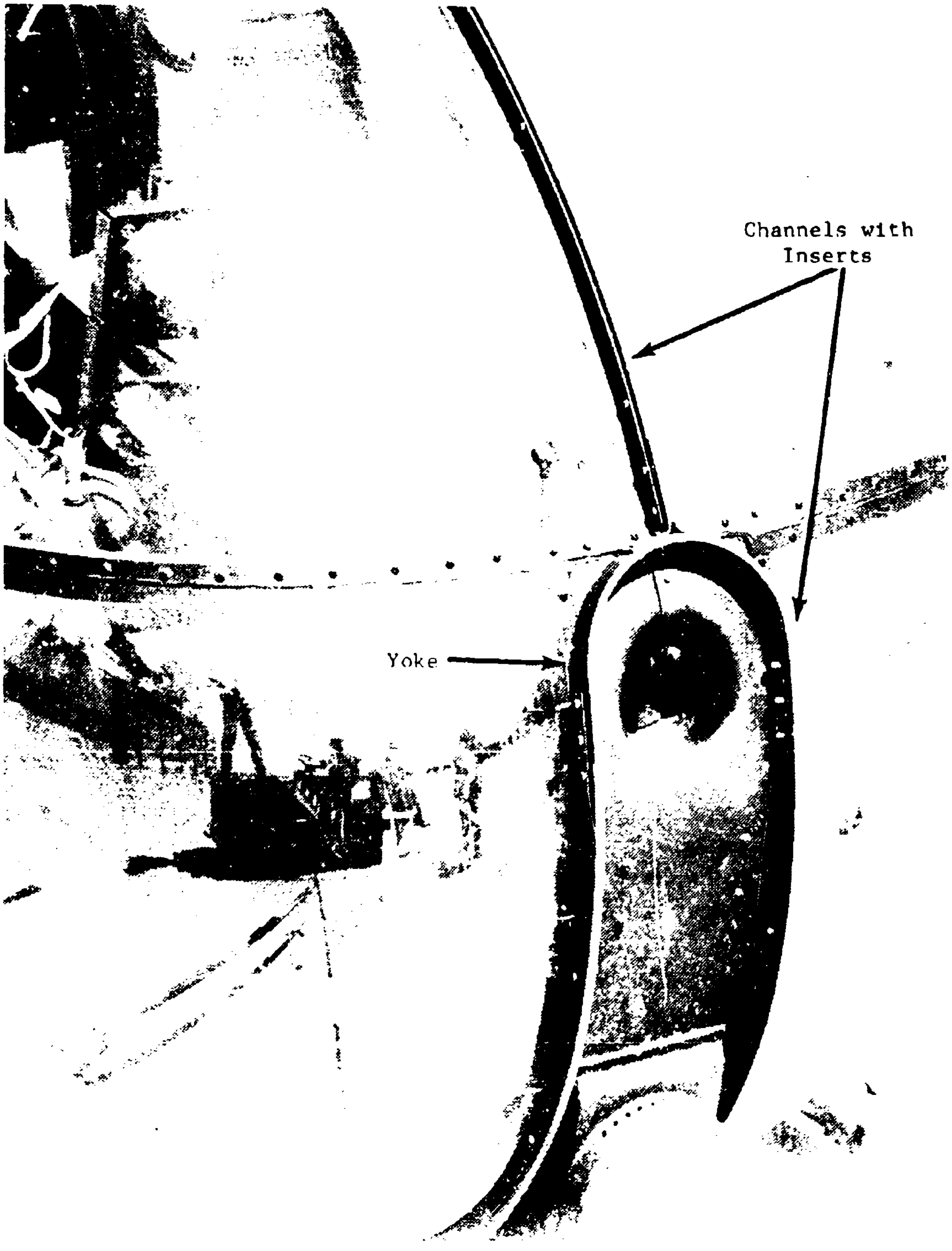


Photo 5. Mid Section Deflector Assembly

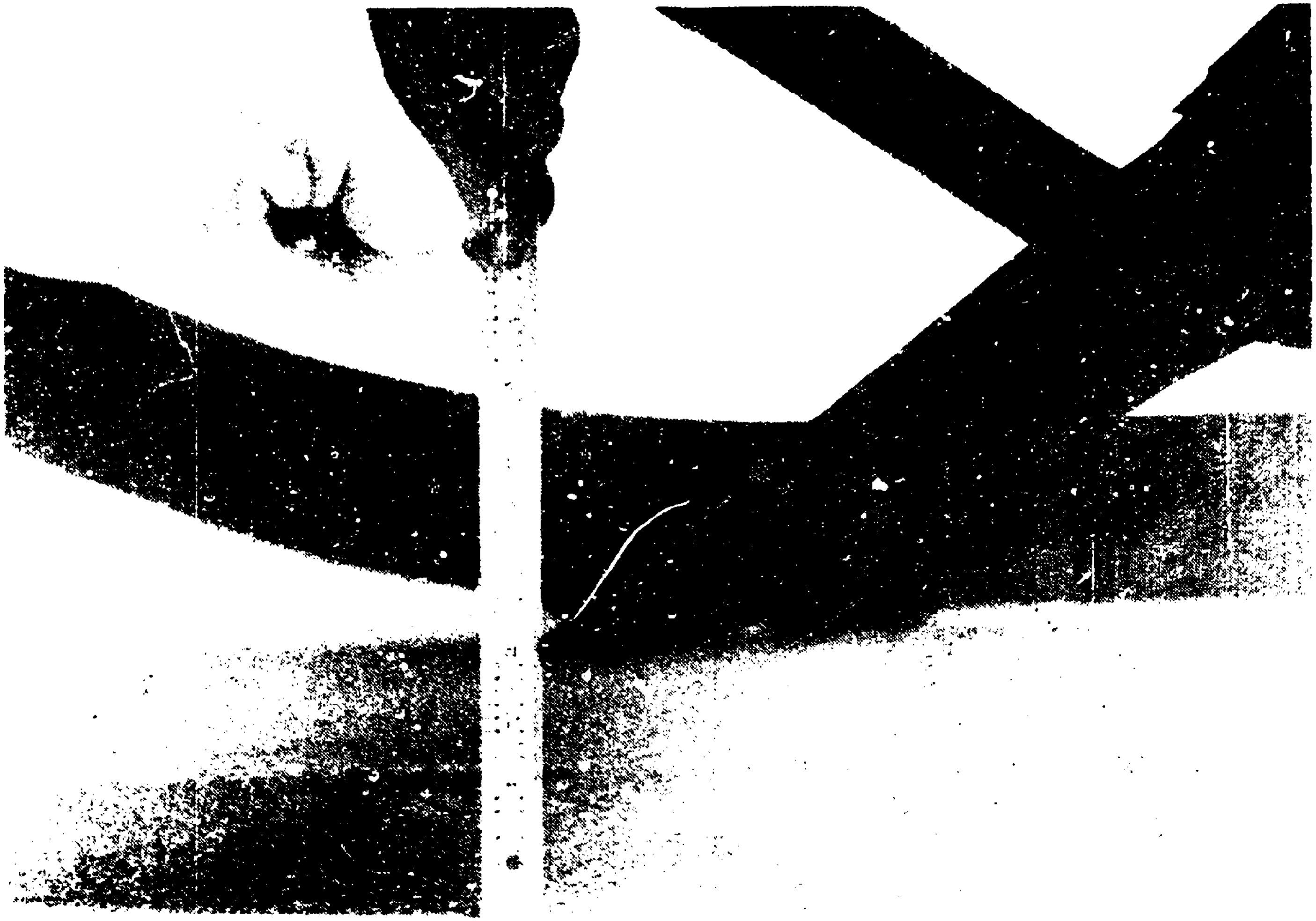


Photo 6. Lower Wire Cutter Ground Clearance

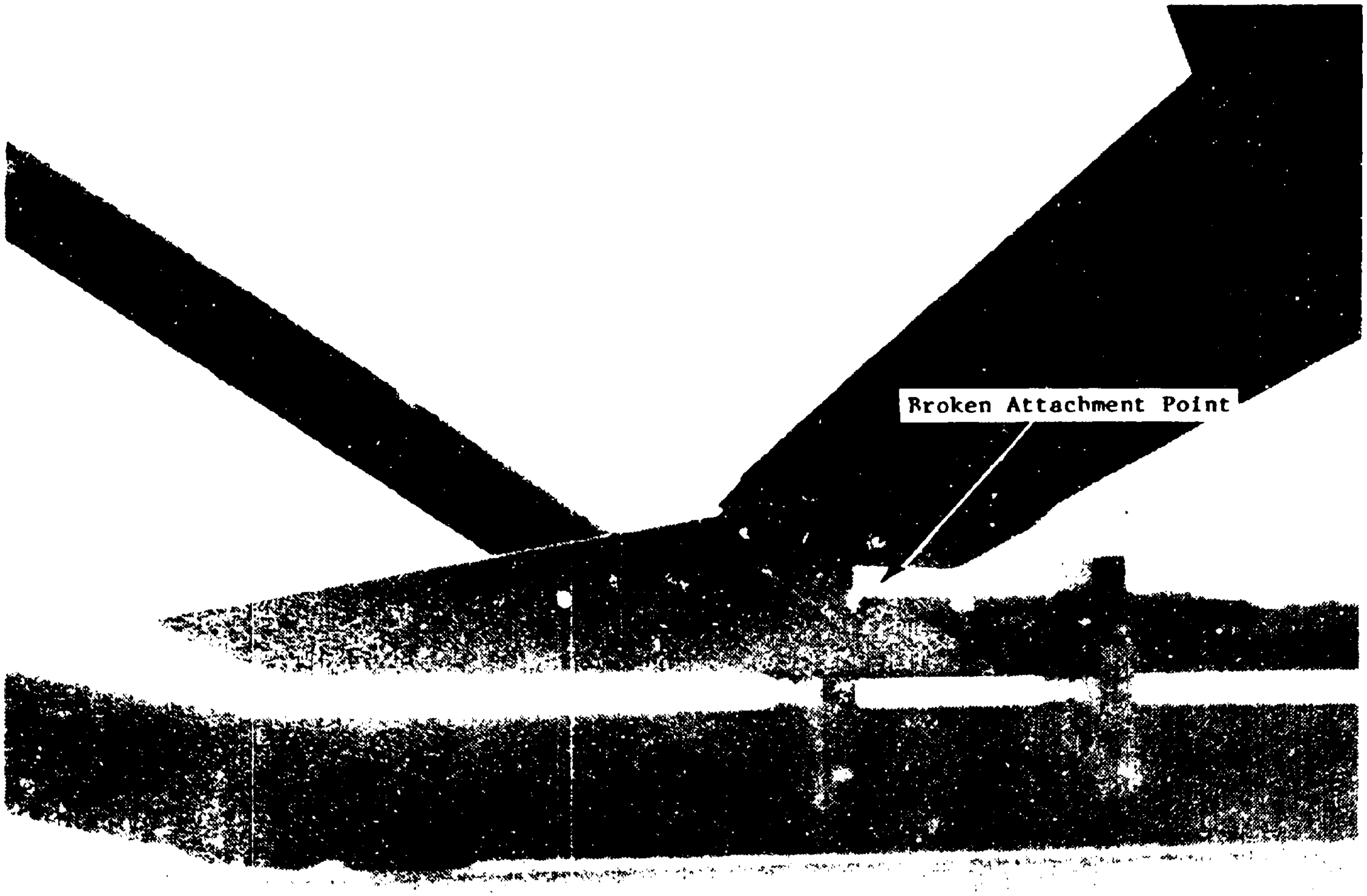


Photo 7. Damaged Lower Cutter After Run-On Landing

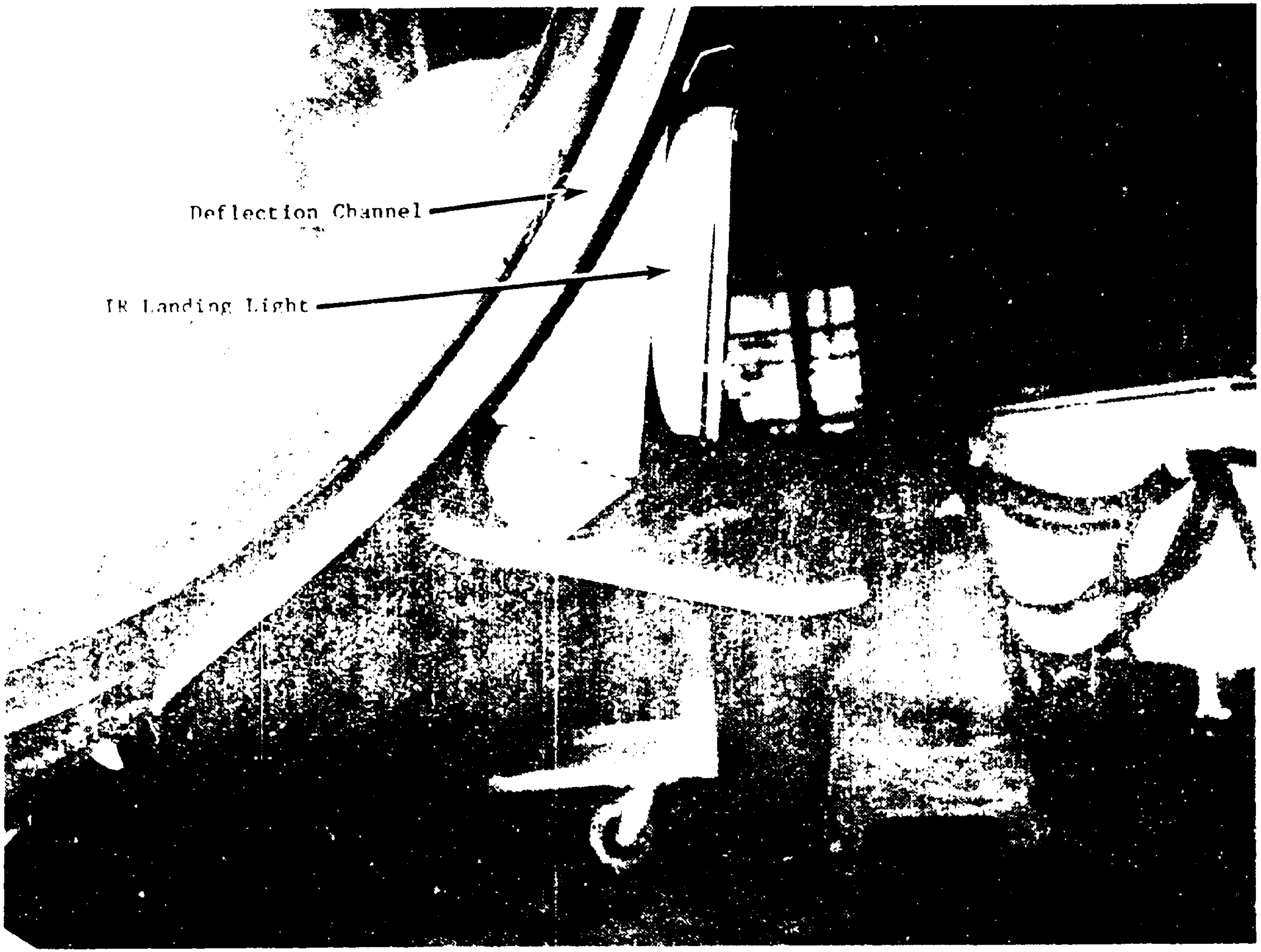


Photo 8. Infrared Landing Light Protrusion

APPENDIX C. INSTRUMENTATION

1. The test instrumentation system was designed, calibrated, installed, and maintained by USAAEFA. Digital and analog data were obtained from calibrated instrumentation and were recorded on magnetic tape and/or displayed in the cockpit. The instrumentation system consisted of various transducers, signal conditioning units, a ten-bit PCM encoder, and an Ampex AR 700 tape recorder. Time correlation was accomplished with a pilot/engineer event switch and onboard recorded and displayed Inter-Range Instrumentation Group (IRIG) B format time of day. Various specialized test indicators displayed data to the pilot and engineer continuously during the flight. A boom with the following sensors was mounted on the right skid tube of the aircraft: swiveling pitot-static head, sideslip vane, and angle-of-attack vane. Photos 1 through 3 show the instrumentation installation. The boom airspeed system calibration is shown in figures 1 through 3.

2. The following parameters were displayed on calibrated instruments in the cockpit:

Airspeed (boom)
Airspeed (ship's system)
Altitude (boom)
Rotor speed
Engine torque
Fuel flow rate
Fuel used (totalizer)
Outside air temperature
Normal acceleration
Angle of sideslip
Vertical velocity
Time of day
Record counter

3. The following parameters were recorded on magnetic tape:

Time code
Run number
Pilot/engineer event
Fuel used
Airspeed (boom)
Altitude (boom)
Main rotor speed
Outside air temperature
Angle of sideslip
Angle-of-attack
Engine torque
Turbine outlet temperature

Gas producer speed
Power turbine output shaft speed
Fuel flow rate
Control positions
    Longitudinal
    Lateral
    Directional
    Collective
Aircraft attitudes and rates
    Pitch
    Roll
    Yaw
Aircraft center of gravity linear accelerations
    Longitudinal
    Lateral
    Normal
Pilot seat accelerations
    Longitudinal
    Lateral
    Vertical

Photo 1. Instrument Panel with Test Instrumentation

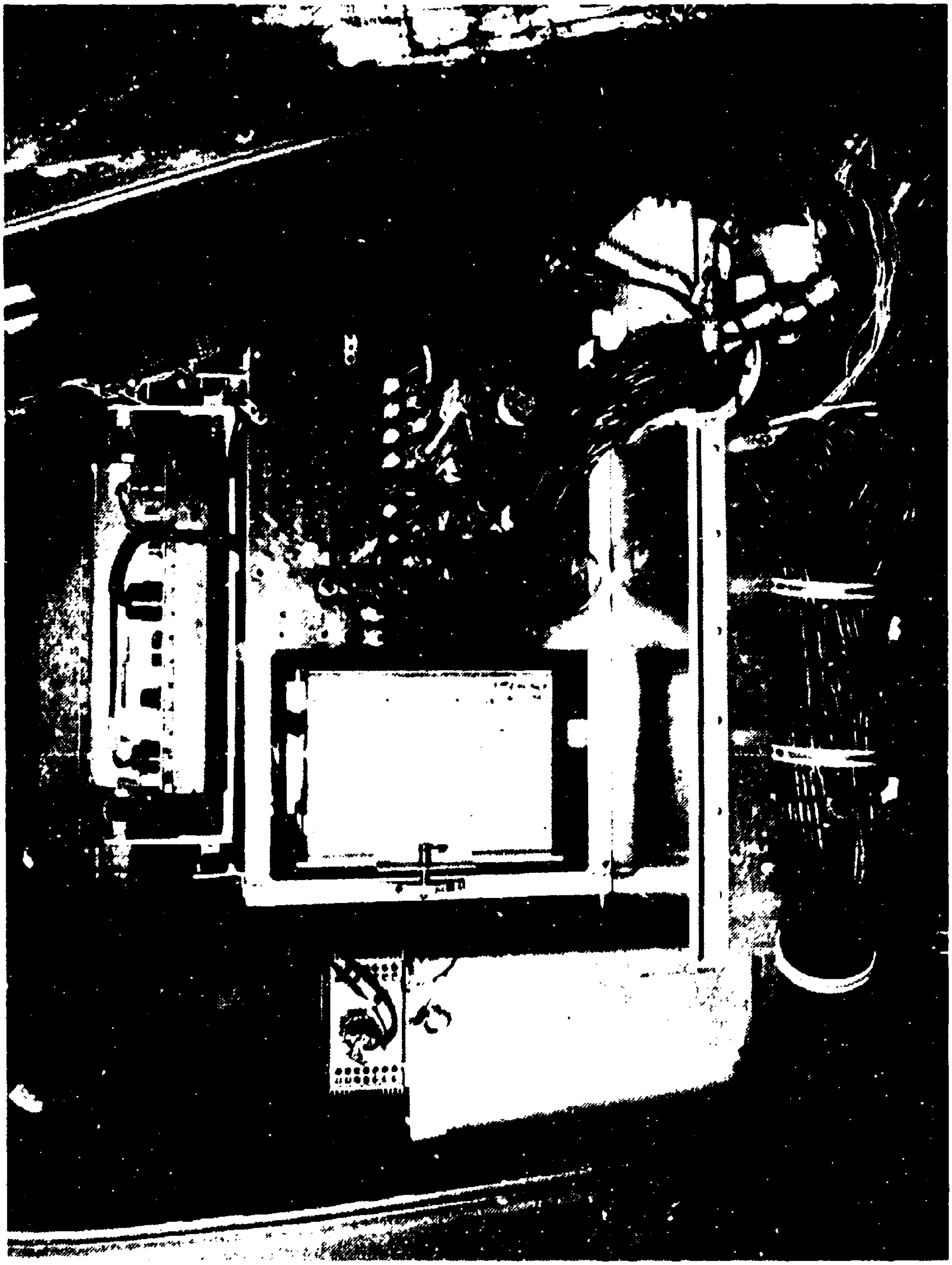


Photo 2. Instrumentation and Data Recording Package Installation

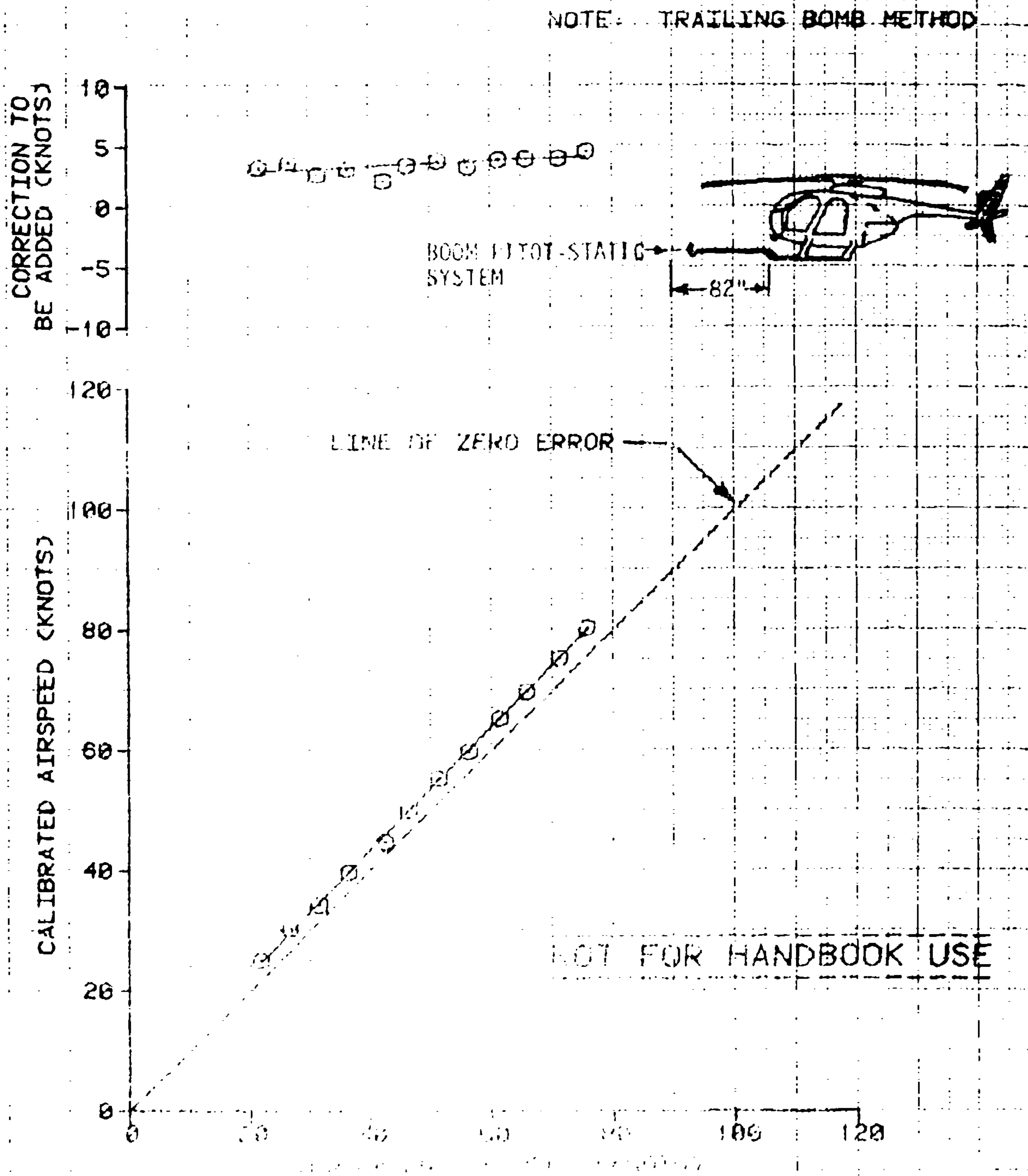
Photo 3. Airspeed Boom (Attached to Right Skid)

FIGURE

BOOM AIRSPEED CALIBRATION

JOH-6A LCH (AH-6C) USA S/N 69-16054

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	FLIGHT CONDITION
2500	98.8(FWD)	0.5	7380	25.0	483	LEVEL



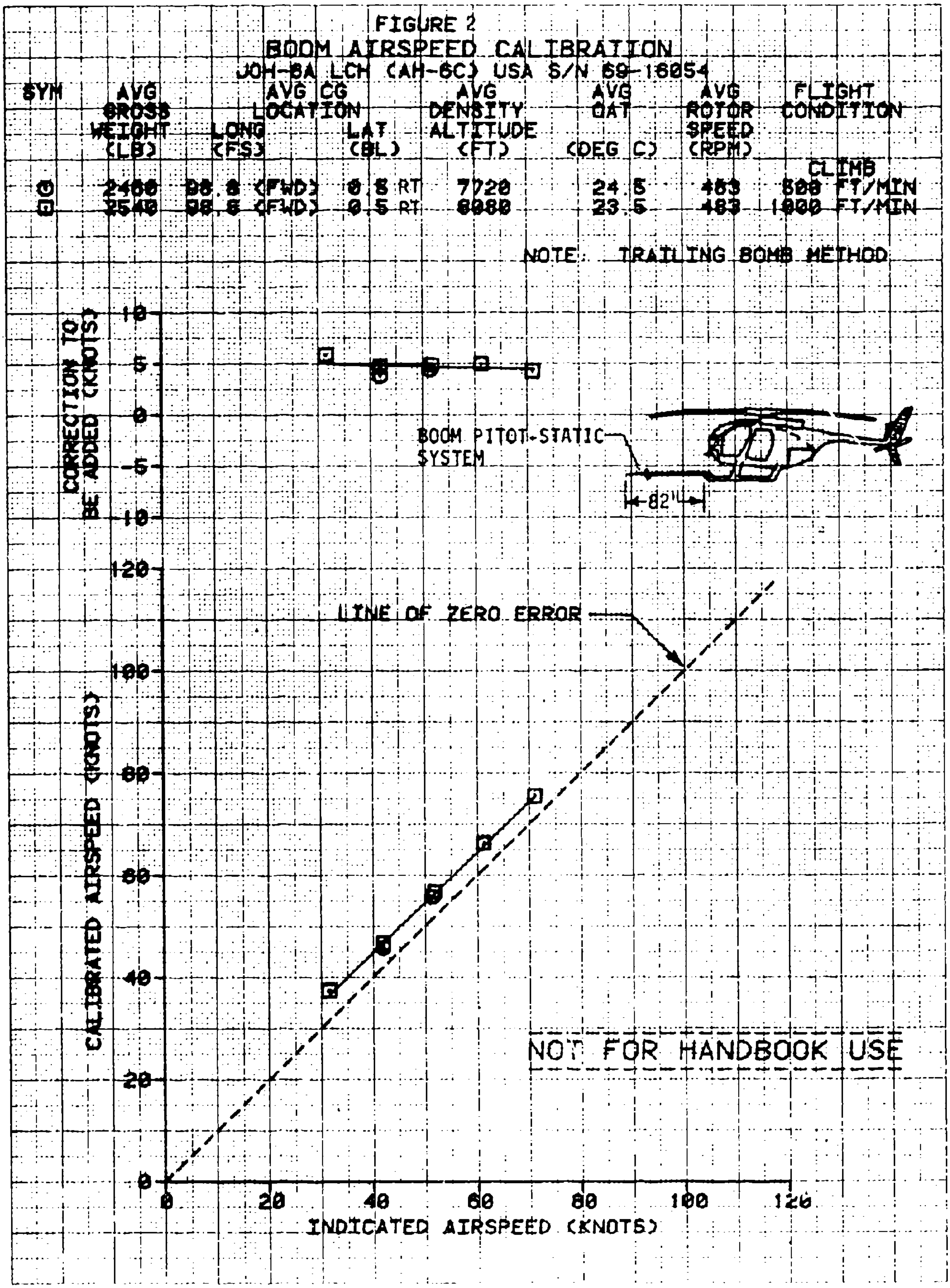


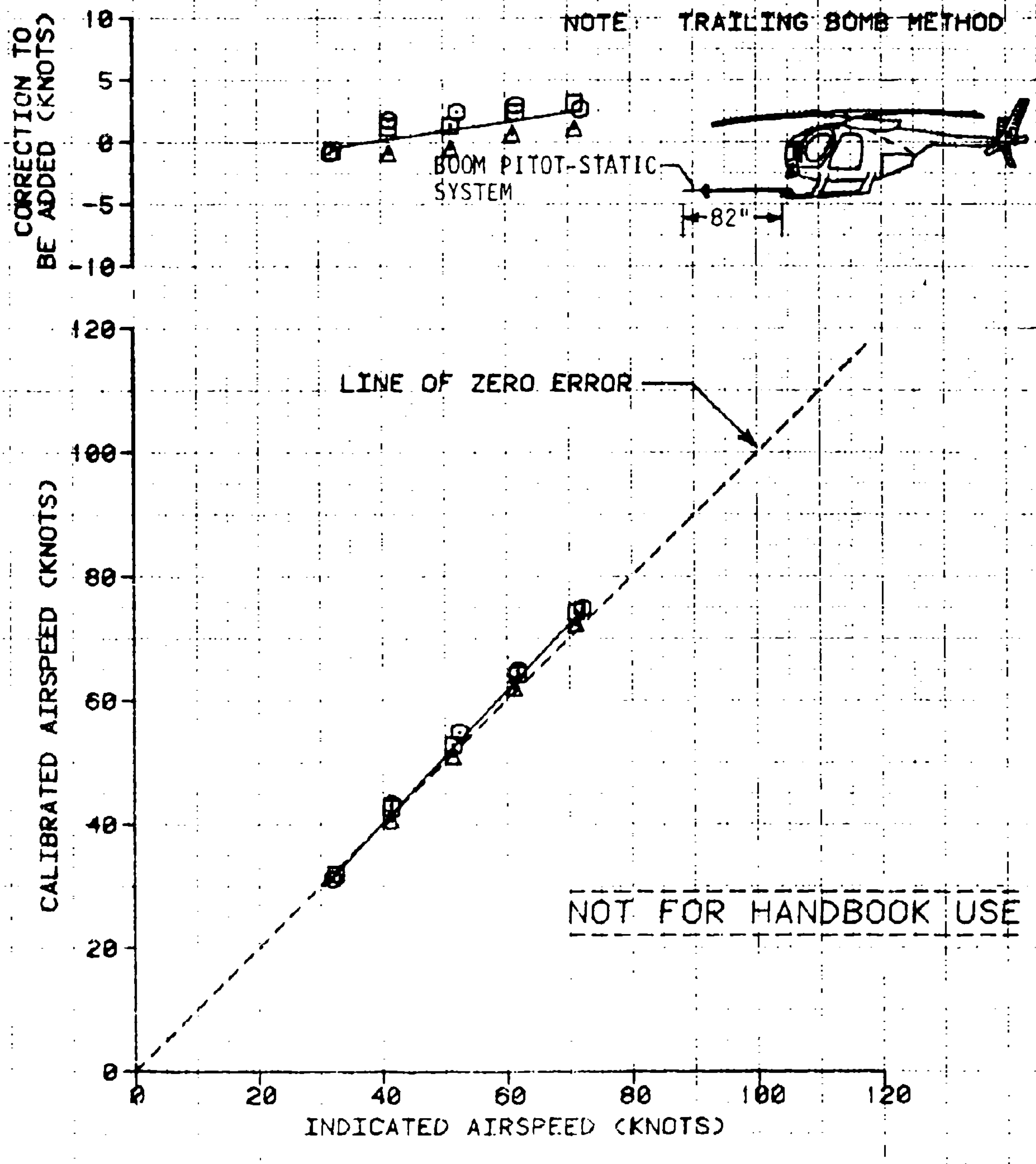
FIGURE 2
BOOM AIRSPEED CALIBRATION
JOH-6A LCH (AH-6C) USA S/N 69-16054
SYM
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENSITY ALTITUDE (FT)
AVG OAT (DEG C)
AVG ROTOR SPEED (RPM)
FLIGHT CONDITION
CLIMB
2460 98.8 (FWD) 0.5 RT 7720 24.5 483 500 FT/MIN
2540 98.5 (FWD) 0.5 RT 8080 23.5 483 1000 FT/MIN
NOTE: TRAILING BOMB METHOD
CORRECTION TO BE ADDED (KNOTS)
BOOM PITOT-STATIC SYSTEM
82"
LINE OF ZERO ERROR
CALIBRATED AIRSPEED (KNOTS)
INDICATED AIRSPEED (KNOTS)
NOT FOR HANDBOOK USE

FIGURE 3

BOOM AIRSPEED CALIBRATION

JOH-6A LCH (AH-6C) USA S/N 69-16054

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	FLIGHT CONDITION
⊙	2460	98.8 (FWD)	0.5RT	7320	24.5	483	DESCENT 500 FT/MIN
⊡	2520	98.8 (FWD)	0.5RT	7620	23.5	483	1000 FT/MIN
△	2500	98.8 (FWD)	0.5RT	7540	24.5	482	AUTOROTATION



APPENDIX D. TEST TECHNIQUES AND DATA ANALYSIS METHODS

HANDLING QUALITIES

1. Stability and control data were collected and evaluated using standard test methods as described in reference 5, appendix A. Definitions of deficiencies and shortcomings used during this test are shown below.

a. Deficiency. A defect or malfunction discovered during the life cycle of an item of equipment that constitutes a safety hazard to personnel; will result in serious damage to the equipment if operation is continued; or indicates improper design or other cause of failure of an item or part, which seriously impairs the equipment's operational capability.

b. Shortcoming. An imperfection or malfunction occurring during the life cycle of equipment which must be reported and which should be corrected to increase efficiency and to render the equipment completely serviceable. It will not cause an immediate breakdown, jeopardize safe operation, or materially reduce the usability of the material or end product.

AIRSPEED CALIBRATION

2. The boom and ships pitot-static system was calibrated by using the trailing bomb method to determine the airspeed position error. Calibrated airspeed (V_{cal}) was obtained by correcting indicated airspeed (V_i) using instrument (ΔV_{ic}) and position (ΔV_{pc}) error corrections.

$$V_{cal} = V_i + \Delta V_{ic} + \Delta V_{pc} \qquad (1)$$

Weight and Balance

3. Prior to testing, the aircraft gross weight and center of gravity (cg) location were determined by using calibrated scales. The aircraft was weighed with full instrumentation on board, wire strike protection system installed, without fuel, and was in the light combat helicopter configuration except for the rocket pod and mount. The aircraft could not be weighed with the rocket pod and mount installed since the rocket pod mount utilizes the aircraft jacking point. The aircraft weight was calculated to be 1903 pounds after addition of the rocket pod and mount weights, with a longitudinal cg location at fuselage station 103.63 and a lateral cg location at buttline 0.50 right.

APPENDIX E. TEST DATA

INDEX

Figure	Figure Number
Static Lateral-Directional Stability	1 through 4
Dynamic Stability	5 through 7
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FIGURE [illegible]

STATIC LATERAL-[illegible] STABILITY

JOH-6A LCH (AH-6[illegible]) [illegible]-18954

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)		AVG ROTOR SPEED (RPM)	AVG CALIBRATED AIRSPEED (KTS)
2840	99.8(FWD)	0.5 RT	[illegible]	[illegible]	483	60

NOTES: 1. [illegible] LEVEL
2. [illegible]
3. [illegible] TRIM

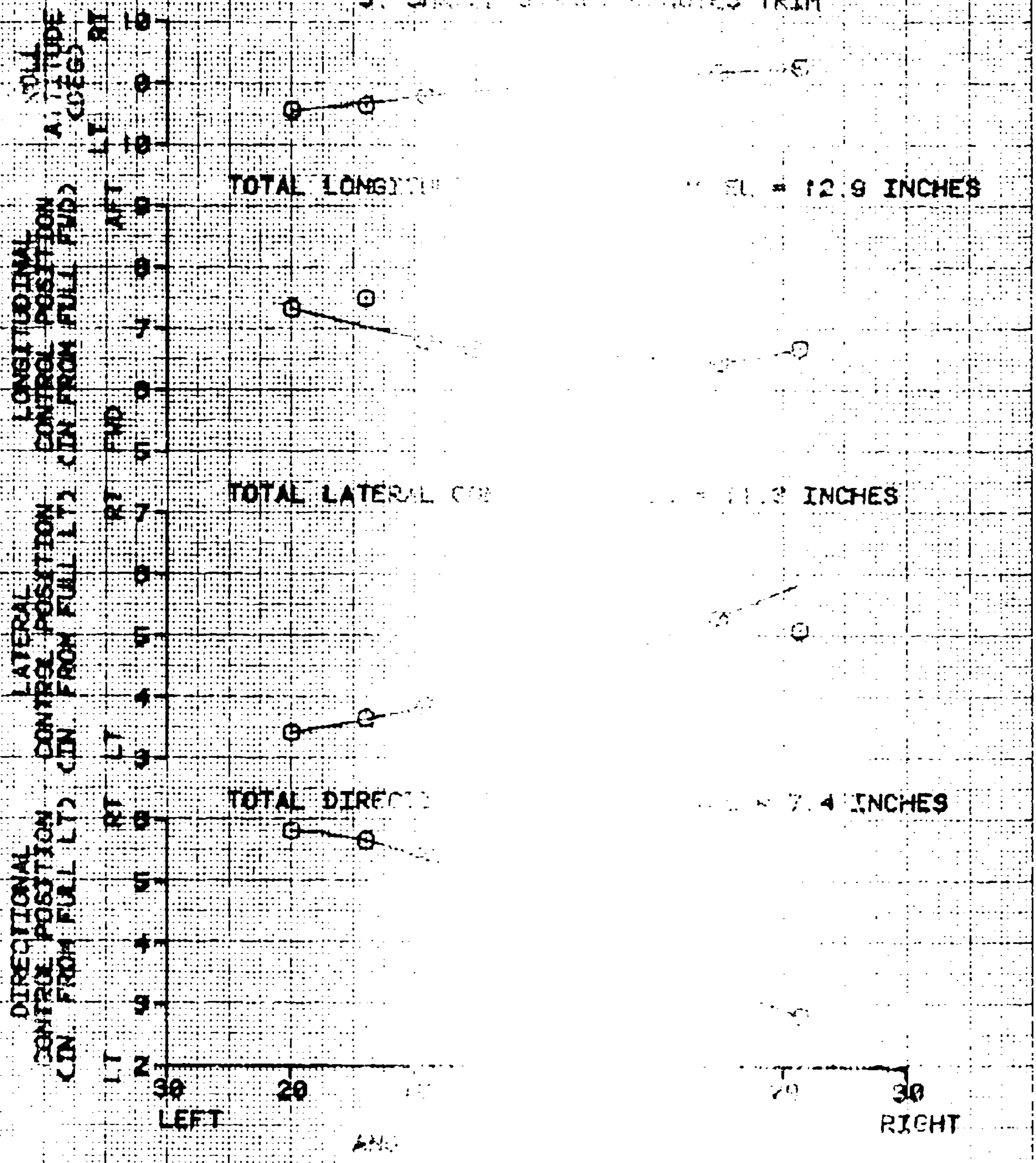


FIGURE 2
STATIC LATERAL-DIRECTIONAL STABILITY
JOH-6A LCH (AH-6C) USA S/N 69-16064

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG CALIBRATED AIRSPEED (KTS)
2810	99.0(FWD)	0.5 RT	6070	21.5	484	79

NOTES: 1. TRIM FLIGHT CONDITION: LEVEL
2. WSPS INSTALLED
3. SHADED SYMBOLS DENOTE TRIM

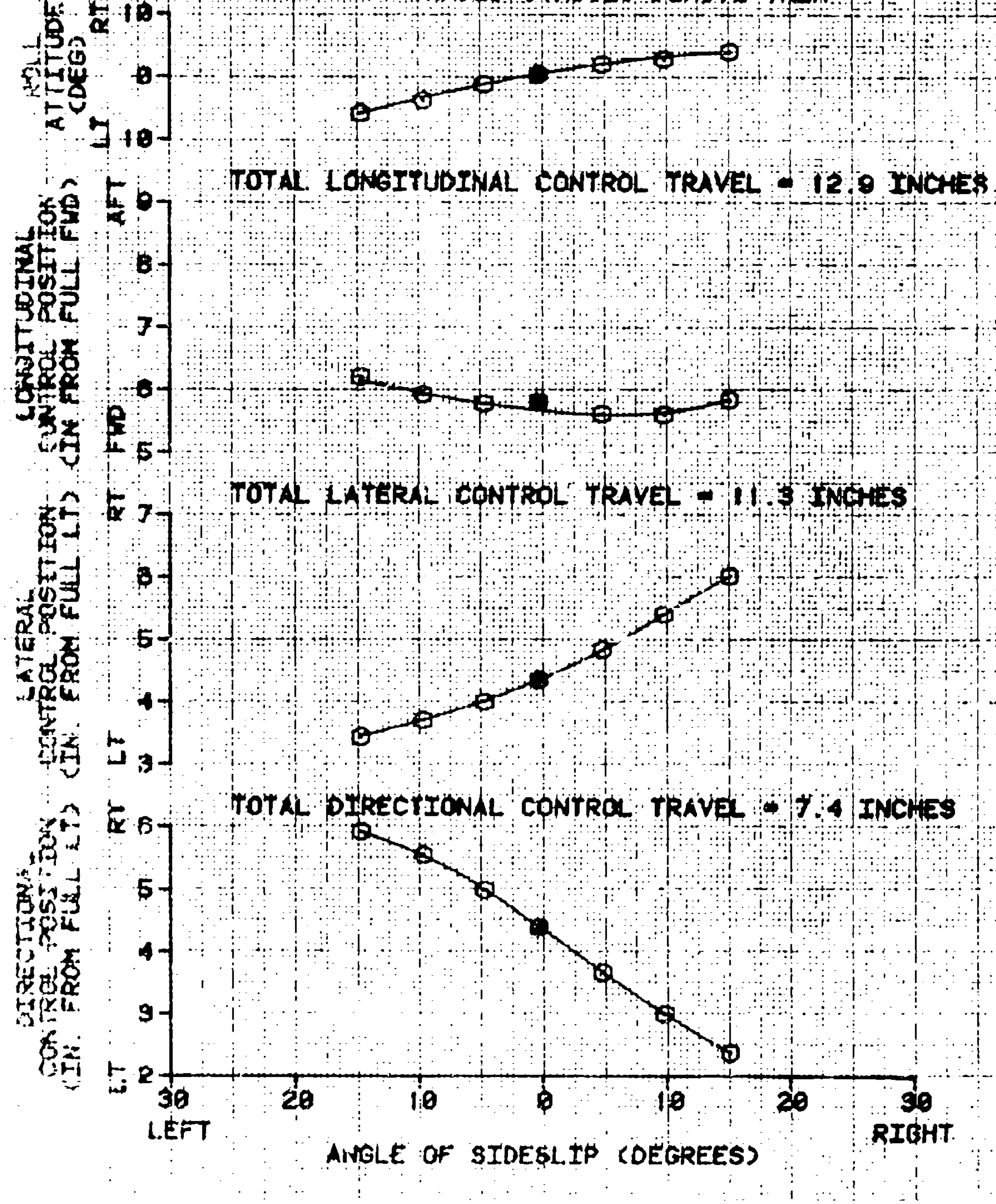


FIGURE 3
STATIC LATERAL-DIRECTIONAL STABILITY
JOH-6A LCH (AH-6C) USA S/N 69-16054

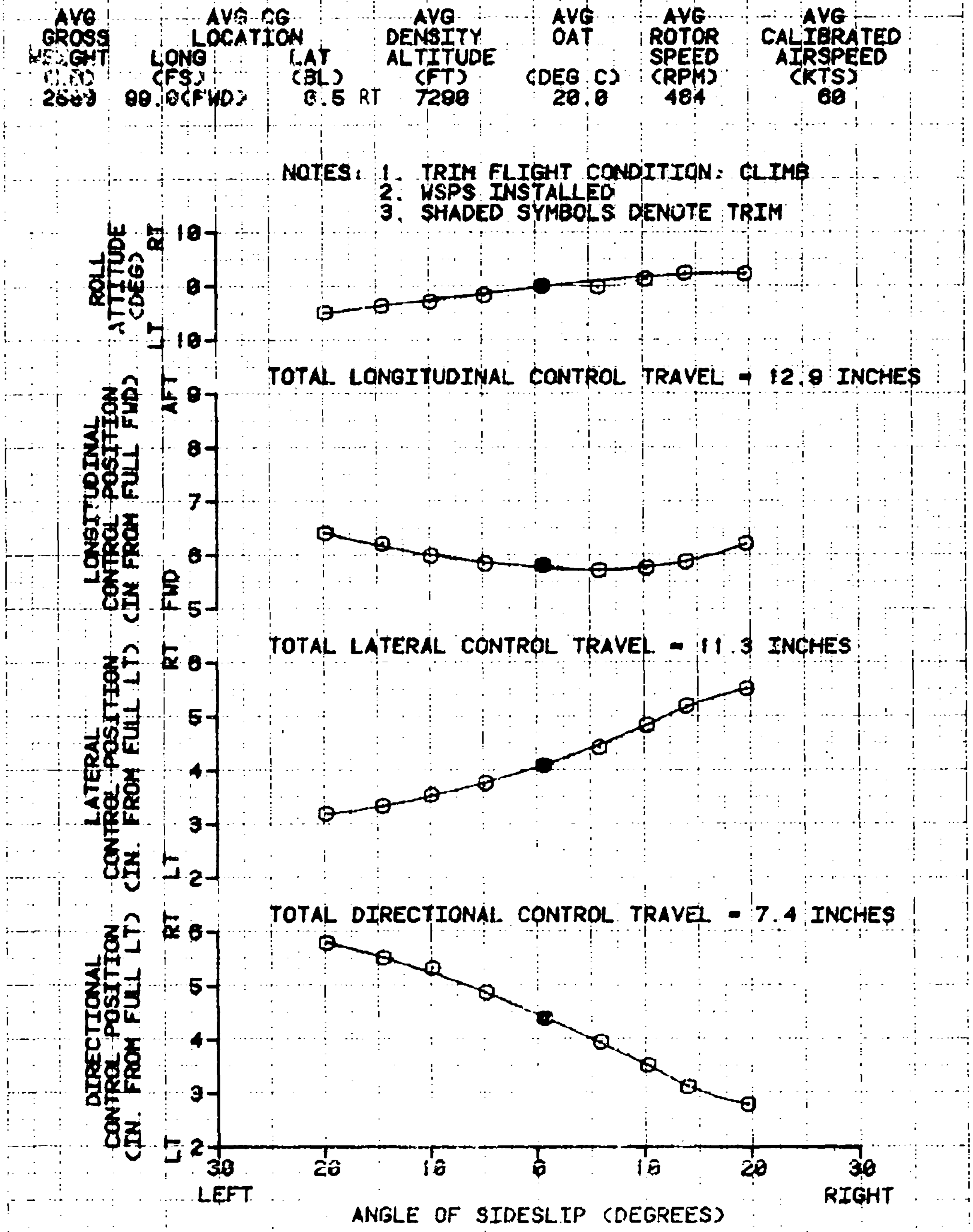


FIGURE 4

STATIC LATERAL-DIRECTIONAL STABILITY
JOH-6A LCH (AH-6C) USA S/N 69-16054

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG CALIBRATED AIRSPEED (KTS)
2560	99.0(FWD)	0.5 RT	6810	20.5	483	59

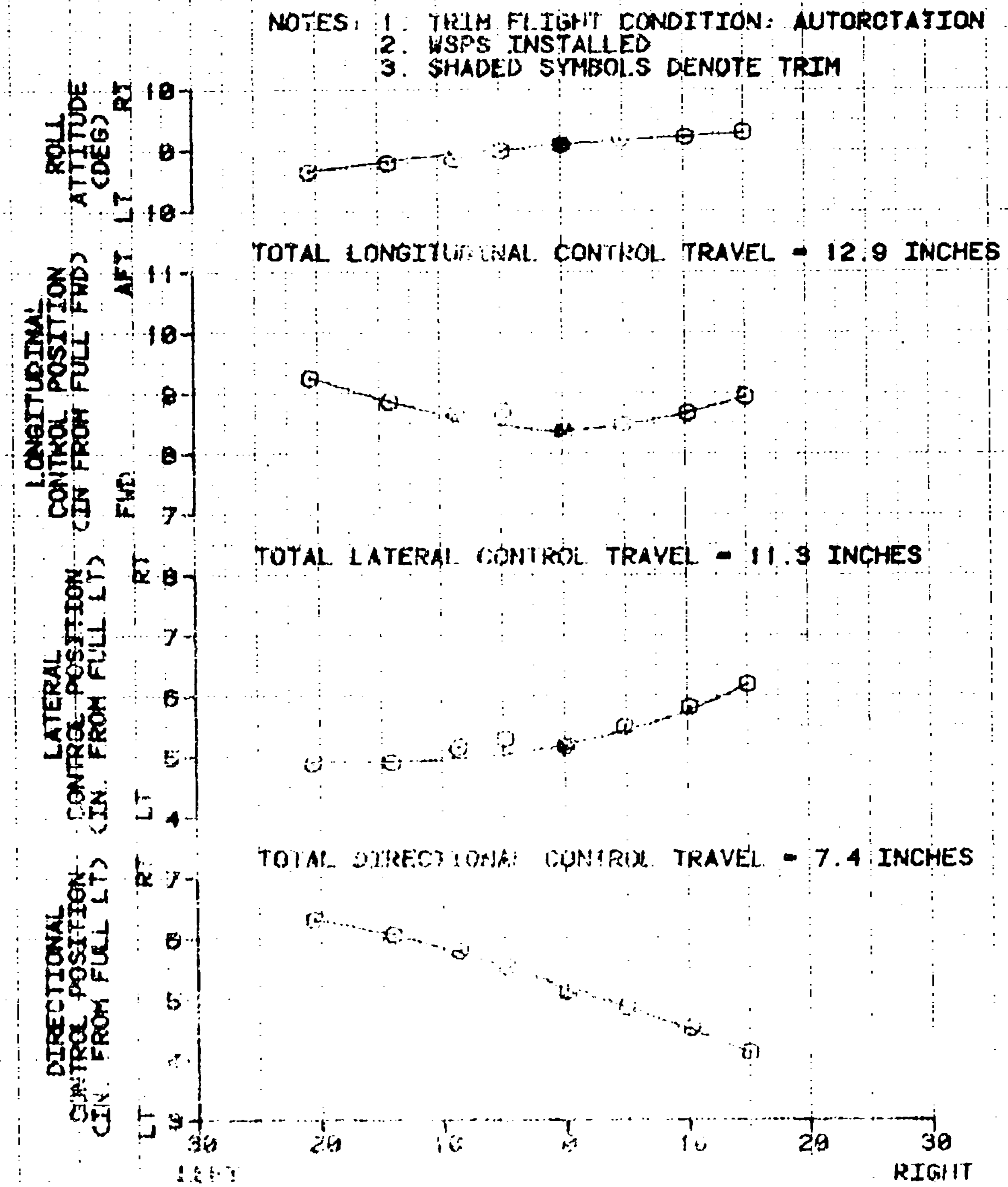


FIGURE 5
PEDAL DOUBLET
JOH-6A LCH (AH-6C) USA S/N 69-16054

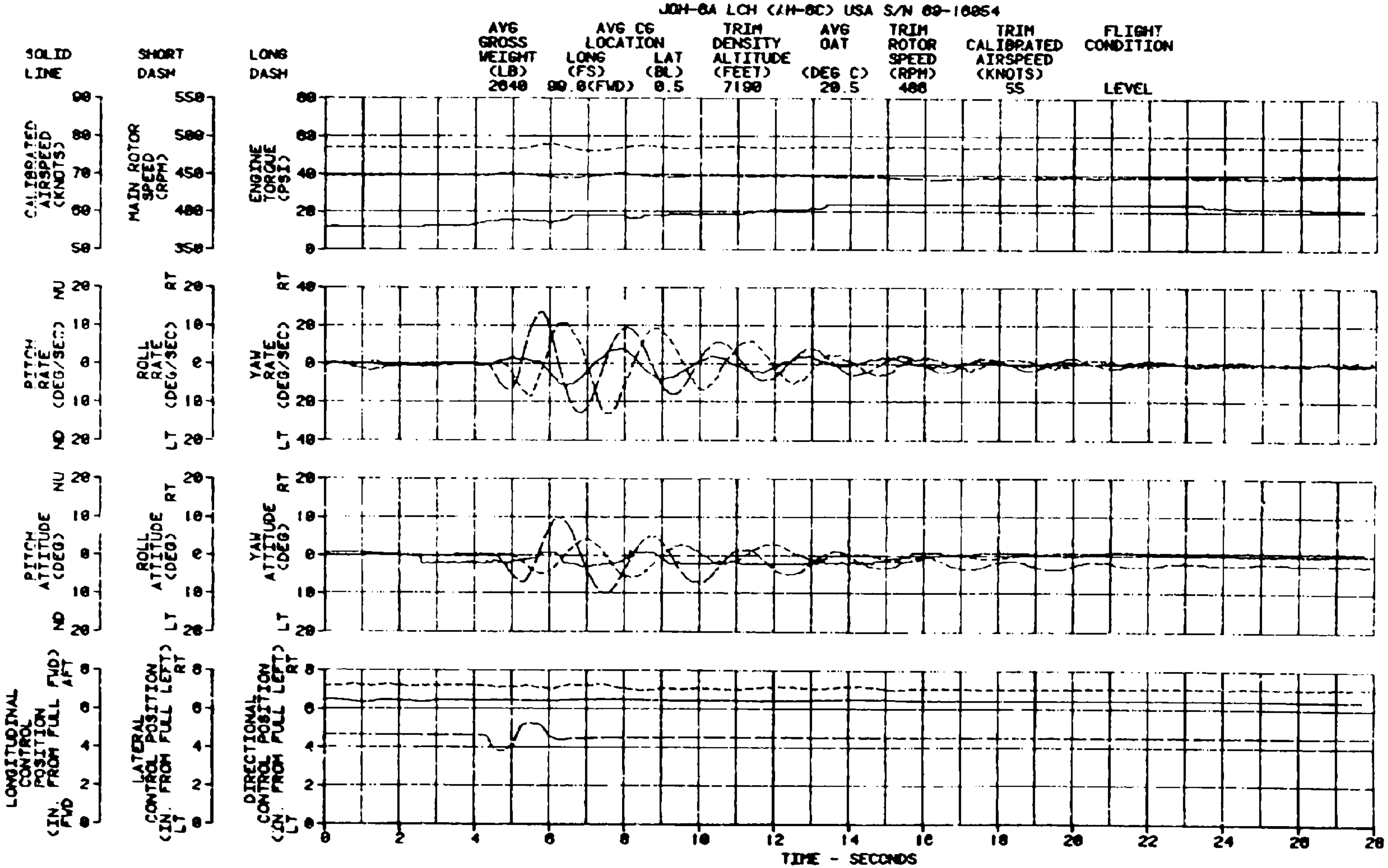


FIGURE 6
PEDAL DOUBLET
JOH-6A LCH (AH-6C) USA S/N 69-16054

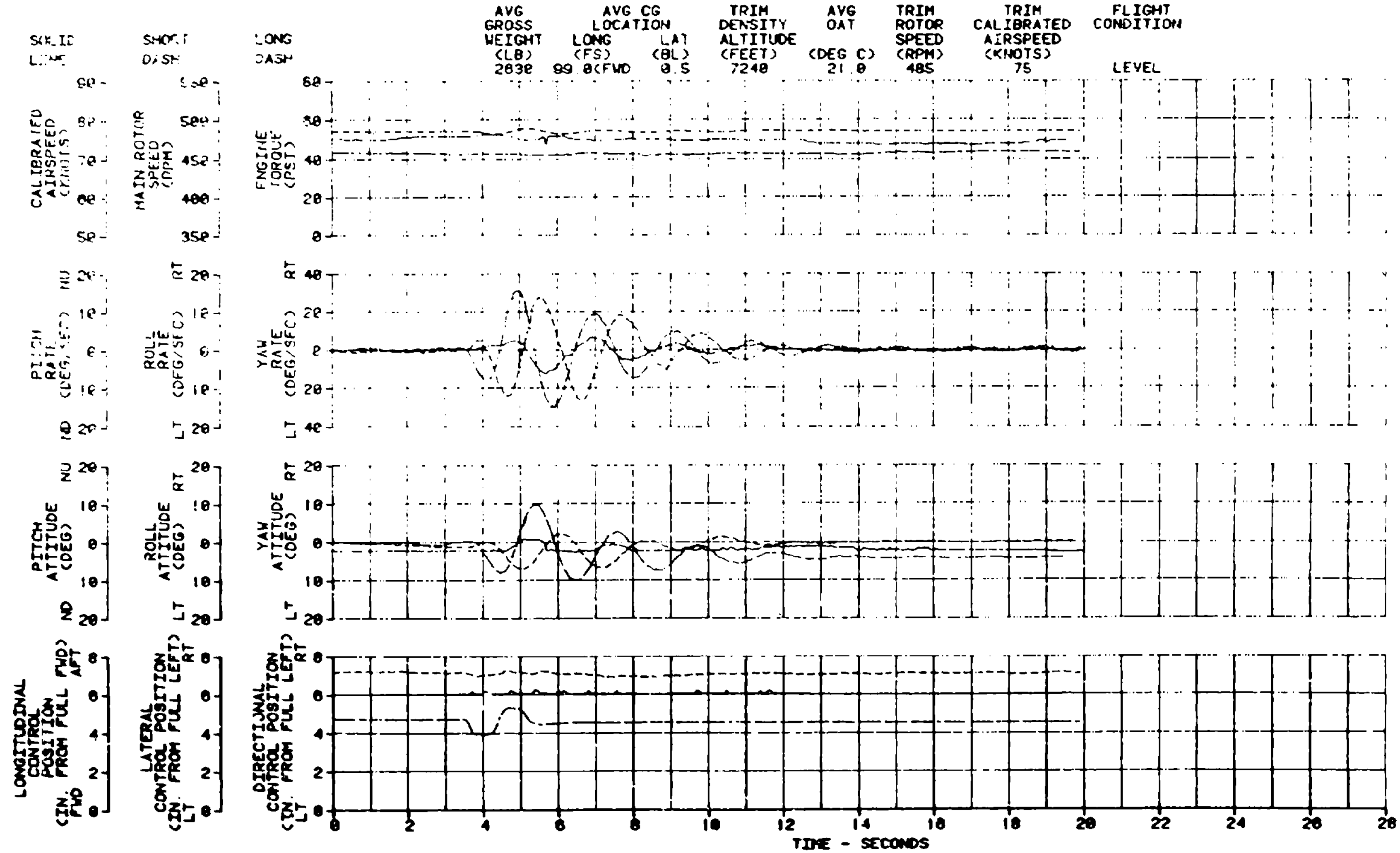


FIGURE 7

PEDAL DOUBLET

JOH-6A LCH (AH-8C) USA S/N 69-16054

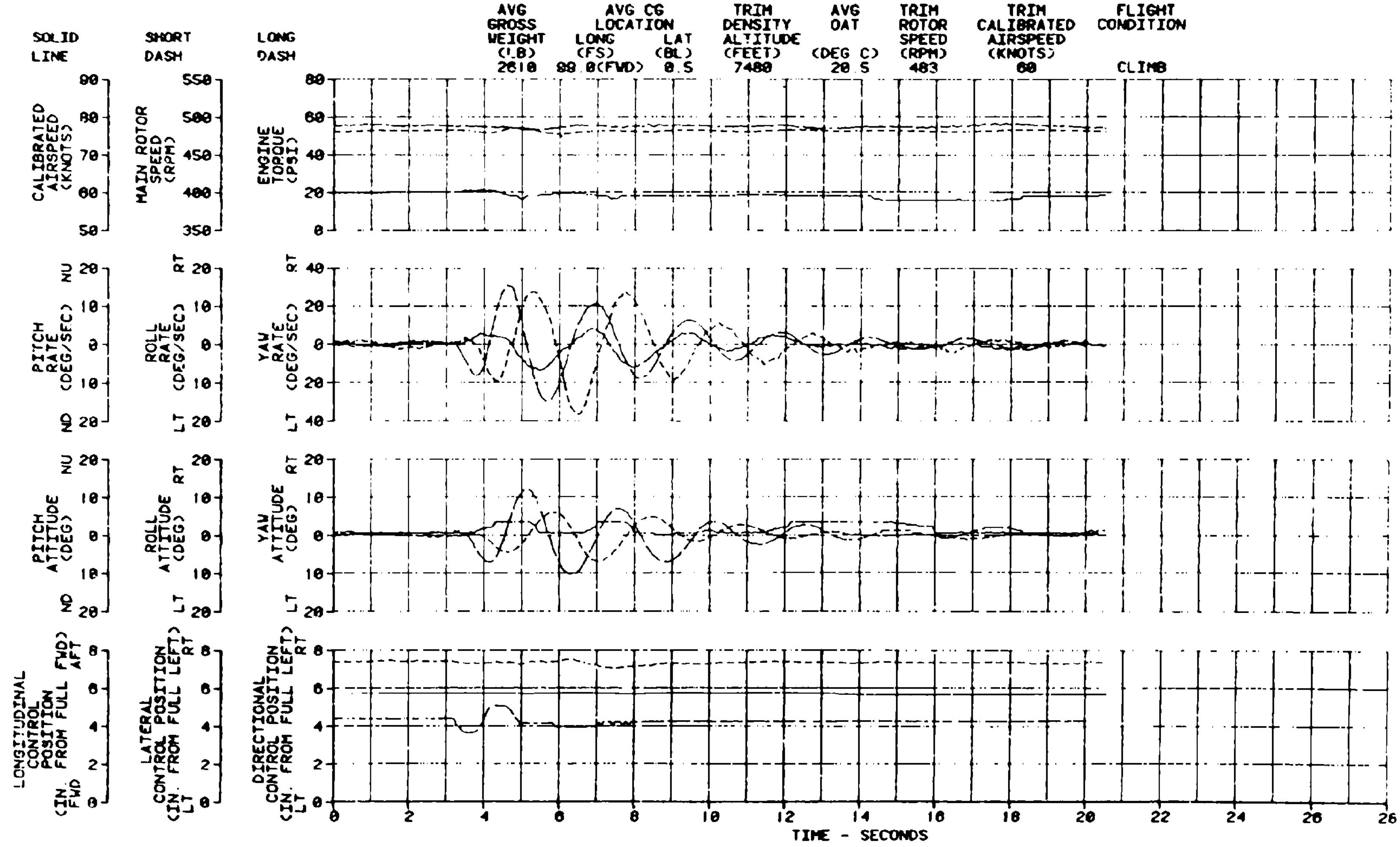


FIGURE 8
LOW SPEED FORWARD AND REARWARD FLIGHT
JOH-6A LCH (AH-6C) USA S/N 69-16064

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	SKID HEIGHT (FT)
2650	99.2(FWD)	0.5 RT	3580	22.0	485	5

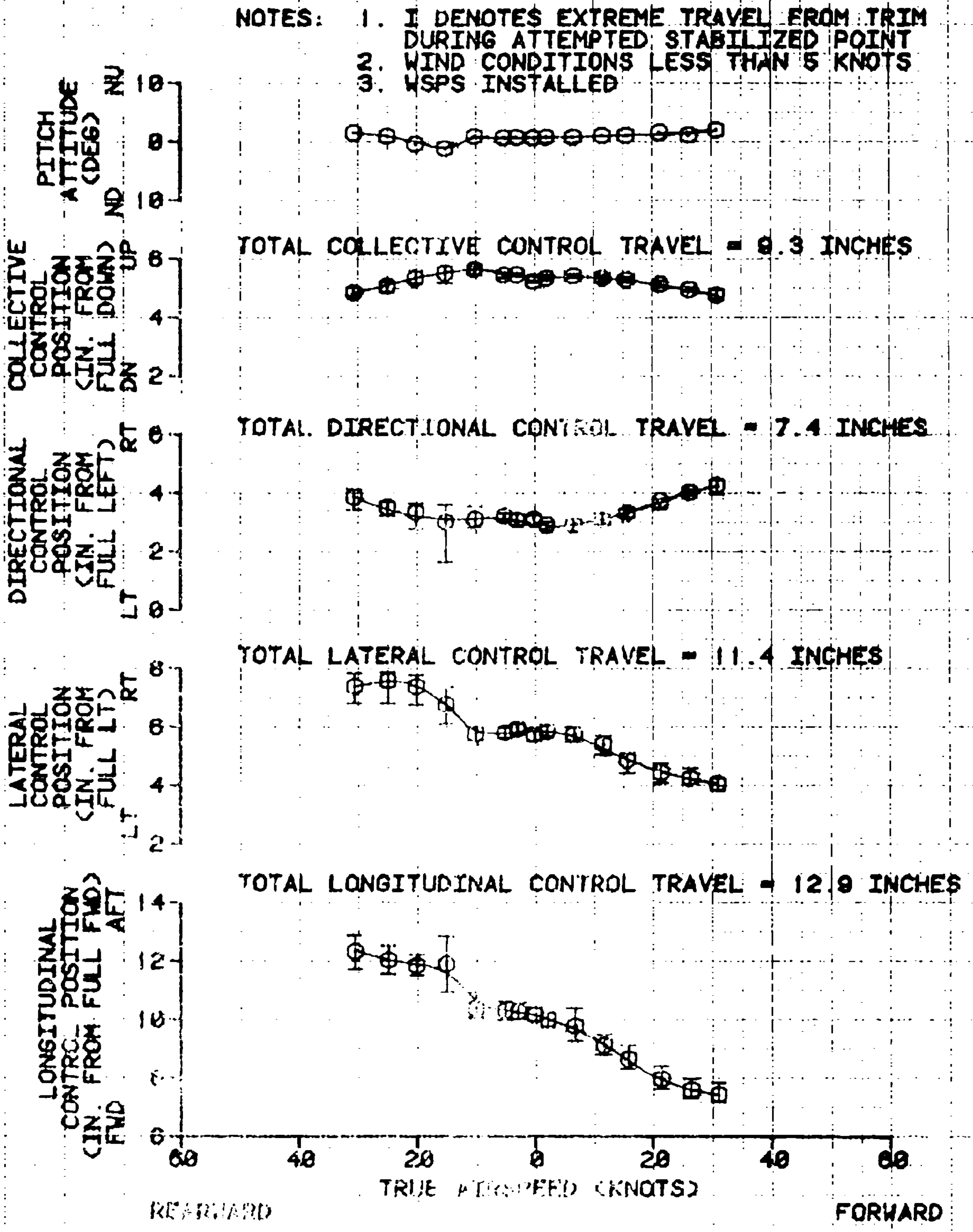


FIGURE 9
SIDEWARD FLIGHT
JOH-6A LCH (AH-6C) USA S/N 69-16054

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	SKID HEIGHT (FT)
2670	99.1(FWD)	0.5 RT	3430	20.5	484	5

NOTES: 1. I DENOTES EXTREME TRAVEL FROM TRIM DURING ATTEMPTED STABILIZED POINT
2. WIND CONDITIONS LESS THAN 5 KNOTS
3. WSPS INSTALLED

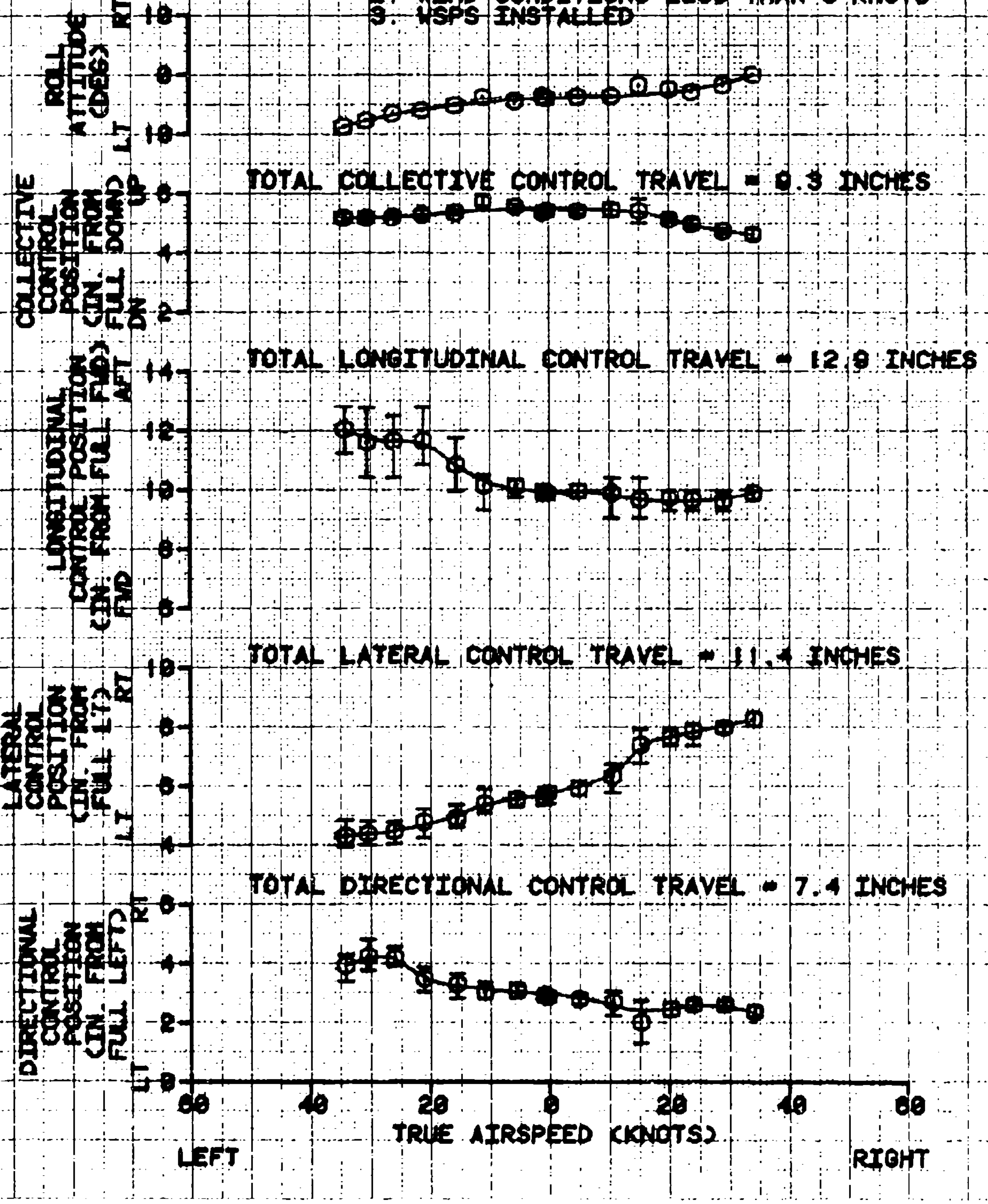


FIGURE 10
LOWSPEED FLIGHT
JOH-6A LCH (AH-6C) USA S/N 69-16054

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	SKID HEIGHT (FT)
2660	99.2(FWD)	0.5 RT	3590	22.0	486	5

NOTES: 1. I DENOTES EXTREME TRAVEL FROM TRIM DURING ATTEMPTED STABILIZED POINT
2. WIND CONDITIONS LESS THAN 5 KNOTS
3. RELATIVE WIND AZIMUTH MEASURED CLOCKWISE FROM NOSE OF AIRCRAFT = 135/315 DEG
4. WSPS INSTALLED

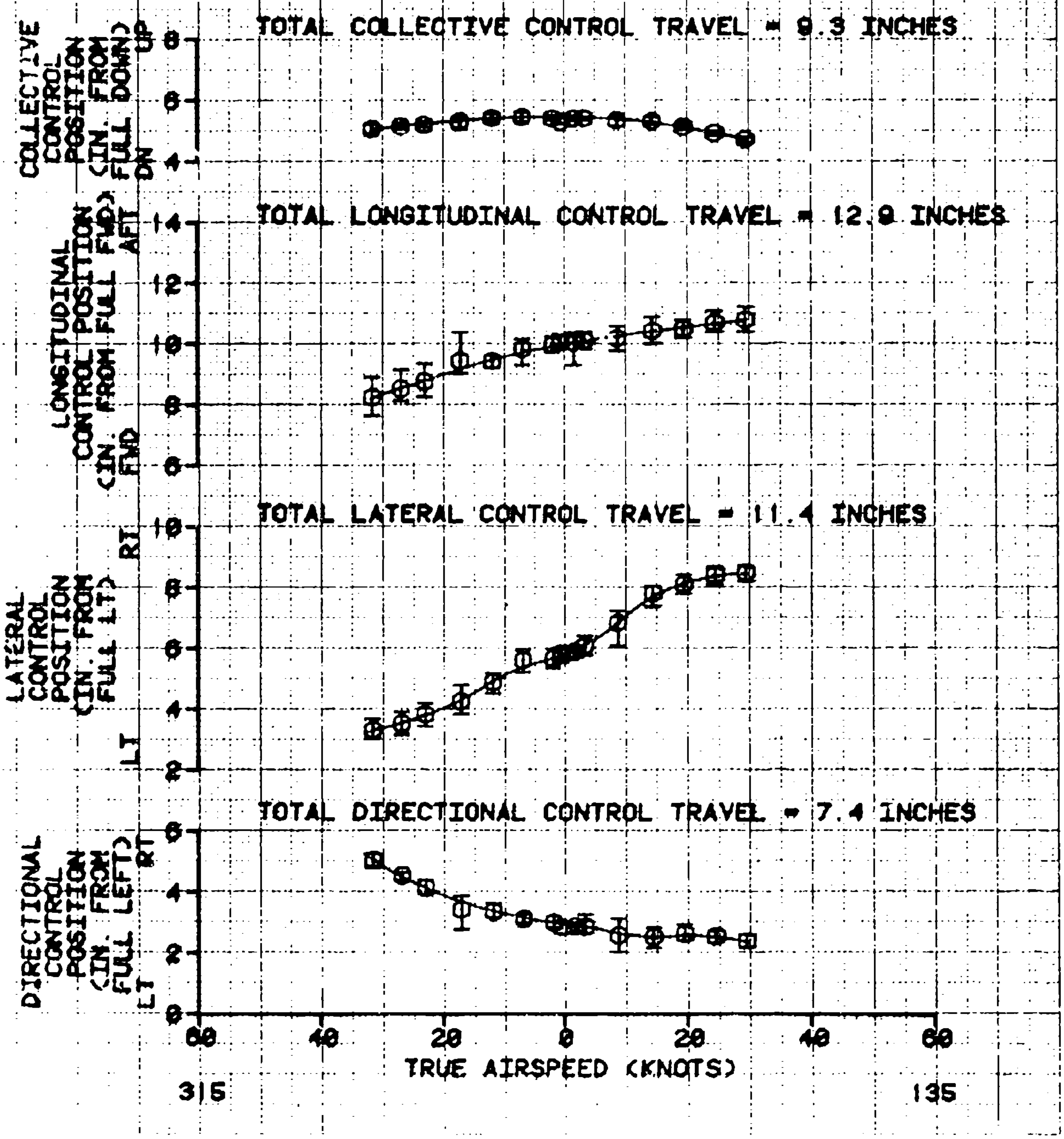
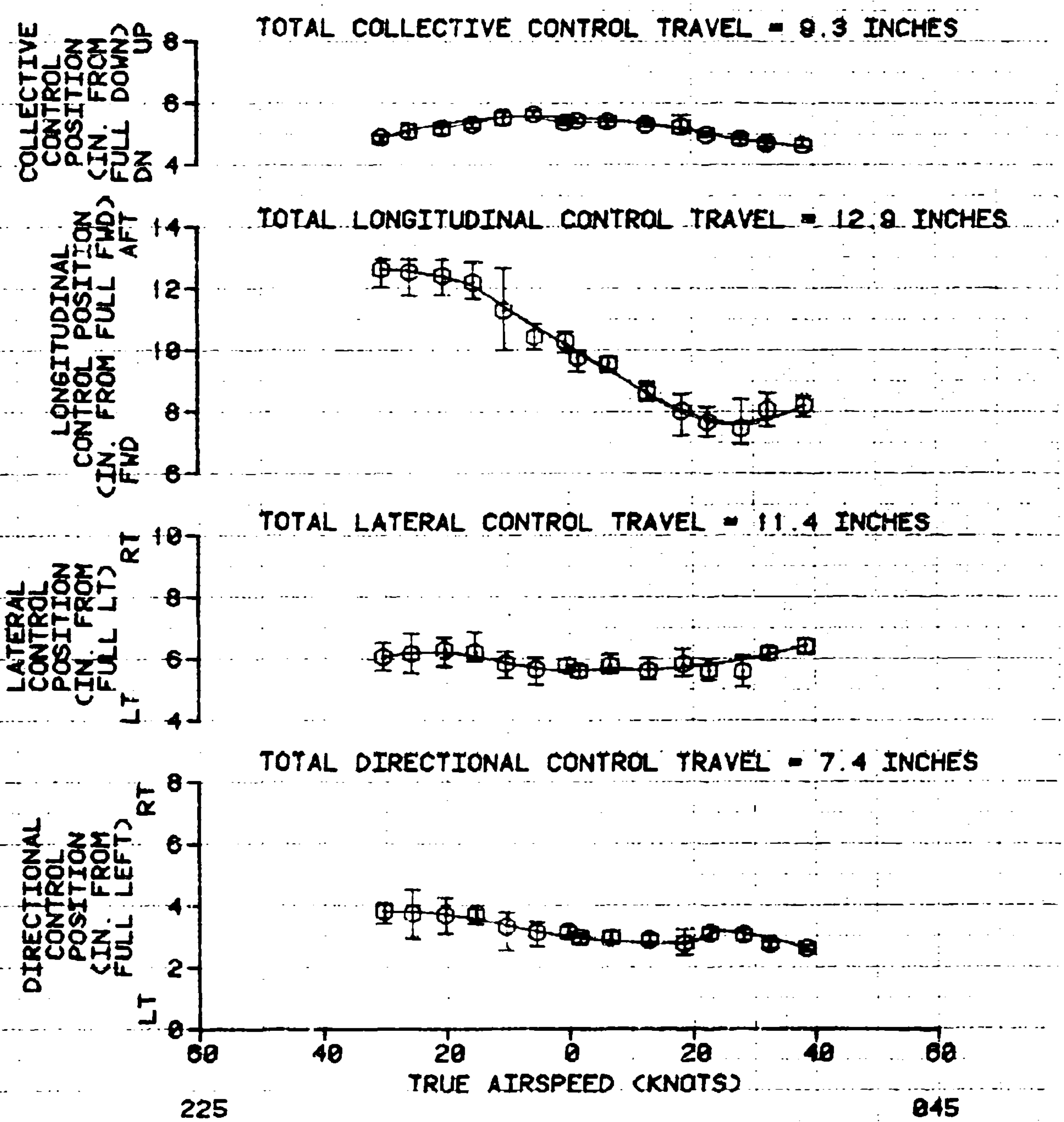


FIGURE 11
LOWSPEED FLIGHT
JOH-6A LCH (AH-6C) USA S/N 69-16054

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	SKID HEIGHT (FT)
2660	99.2(FWD)	0.5 RT	3500	21.5	488	5

NOTES:
1. I DENOTES EXTREME TRAVEL FROM TRIM DURING ATTEMPTED STABILIZED POINT
2. WIND CONDITIONS LESS THAN 5 KNOTS
3. RELATIVE WIND AZIMUTH MEASURED CLOCKWISE FROM NOSE OF AIRCRAFT = 045/225 DEG
4. WSPS INSTALLED



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